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Extent of Contamination Study

Waukegan Tar Pit Site
Waukegan, Illinois

May 1991

Engineering Company

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Affidavit

I hereby certify under penalty of law that based on my personal knowledge and appropriate inquiries of all other persons involved in preparation of the report, the information submitted is true, accurate, and complete to the best of my knowledge and belief.

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5/8/91
Date

Lawrence D. Dalen, P.E.

BARR ENGINEERING COMPANY

EXTENT OF CONTAMINATION STUDY
WAUKEGAN TAR PIT SITE
WAUKEGAN, ILLINOIS

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This report was prepared to fulfill the requirements of paragraph 4.b of the March 11, 1991 Administrative Order by Consent (AOC) between the U.S. EPA and the Waukegan Tar Pit Site respondents, North Shore Gas Company, Elgin, Joliet, and Eastern Railway Company, and North Shore Sanitary District. The report summarizes the procedures, methods, and findings of the Extent of Contamination study of the Waukegan Tar Pit Site, in accordance with the AOC requirements. The Extent of Contamination study goals and methodologies are described in detail in the February 1991 Work Plan titled "Extent of Contamination Study, Waukegan Tar Pit Site" prepared by Barr Engineering Company. The methodologies for the supplemental investigation, performed in March 1991 are described in the March 12, 1991 letter.

The objectives of the Extent of Contamination study, as defined by the AOC are:

A. To conduct an extent of contamination study of the tar pit, including sampling and analysis, to define the vertical and lateral extent of hazardous substances in the tar pit.

B. To submit a report which shall summarize the study and identify the removal methods for the tar pit which must be protective of human health and the environment.

1. SITE DESCRIPTION

The Waukegan Tar Pit Site is located in the east-central part of Waukegan, Illinois approximately 1/2 mile northeast of the downtown business district and 1/2 mile west of Lake Michigan. Figure 1 shows the Waukegan Tar

Pit Site location. The site is bounded on the north by Dahringer Road, on the west by Pershing Road and a rail yard of the Chicago Northwestern Railroad. The immediate vicinity of the tar pit is shown on Figure 2. A bluff rises beyond the rail yard and above the bluff line, approximately 2,000 feet from the Waukegan Tar Pit Site, is Sheridan Road and residential development. The Waukegan Tar Pit Site is bounded on the east by the EJ&E railway line and the facilities of the North Shore Sanitary District. The Waukegan Tar Pit Site is bounded on the south by vacant property owned by the City of Waukegan and EJ&E. The Waukegan Tar Pit Site is bounded on all sides by a chainlink fence.

The tar pit hereafter referred to is located in the northeast corner of the Waukegan Tar Pit Site. The tar pit is covered by 4 to 6 inches of water and occupies an area estimated to be 15,800 square feet, or 0.36 acres. The tar pit is the subject of the AOC.

The topography of the ground surrounding the tar pit is nearly level. Past disposal of gypsum and metal strapping immediately south of the tar pit has left the soils there softer than elsewhere in the immediate vicinity of the tar pit. Surface waters on the site are limited to water collecting on the tar pit.

2. TAR PIT HISTORY

Based on information from the Waukegan Tar Pit Site assessment performed in September 1990 by the U.S. EPA and Technical Assistance Team, the following events have occurred at the tar pit:

07/07/88	Fire broke out in the tar pit. The Waukegan Fire Department was summoned. The Illinois Environmental Protection Agency was also at the scene of the fire and later submitted a fire incident report describing the fire and its location.

09/06/90 An assessment of the pit was conducted by U.S. EPA and the Technical Assistance Team (TAT) from Roy F. Weston, Inc., consultants.

09/19/90 The PRPs were given verbal notice to restrict access to the tar pit by humans and wildlife.

09/20/90 The PRPs began installing a barrier consisting of a fence to enclose the WTPS and strings of flags across the tar pit to deter migrating waterfowl from landing. The barrier was completed on September 28, 1990.

10/10/90 Roy F. Weston, Inc. submitted the results of the TAT 1990 investigation. The report states that the tar pit is beneath a pond which is approximately 125 feet by 60 feet. White material, believed to be gypsum, was observed on the south end of the tar pit.

A sample of water from the top of the tar pit indicated the presence of benzene at 69 ppb, toluene at 59, ppb, and xylene at 18 ppb.

A sample of the tar pit sediment indicated the presence of ethyl benzene at 230 ppm, xylene at 2,000 ppm, o-dichlorobenzene at 6,700 ppm, nitrobenzene at 620 ppm, benzene at 530 ppm and toluene at 810 ppm.

A sample of the tar was collected from a tar seep 50 feet north of the tar pit. Analysis indicated the presence of ethyl benzene at 710 ppm, xylene at 660 ppm, cyclohexanone at 80 ppm, o-dichlorobenzene at 210 ppm, benzene at 180 ppm and toluene at 380 ppm.

3. SITE INVESTIGATION

The investigation of the extent of contamination at the Waukegan Tar Pit Site was conducted in two phases. The first targeting phase of the investigation employed hand probes of the tar pit to estimate the thickness of free tar and shallow powered-auger borings were performed to estimate the extent of tar mixed with soil in the vicinity of the tar pit. On the basis of the results of the first phase of the investigation, a second phase was conducted which utilized a track-mounted drilling rig to perform soil borings and continuous soil sampling. The purpose of the second phase of the investigation was to evaluate the lateral and vertical extent of tar in the soil in the vicinity of the tar pit.

A. Phase I Investigation

On February 27-28, 1991, the targeting phase of the investigation of the Waukegan Tar Pit Site was conducted. The targeting phase of this investigation was to delineate and survey the perimeter of the existing tar pit, hand probe the tar pond to determine tar depth, collect composite samples of tar from three locations, and hand probe the edges of the tar pit to determine if tar exists beyond the perimeter of the tar pit.

A 3/4-inch diameter galvanized steel pipe, fitted with a threaded end cap, was used to probe the thickness of tar in the tar pit. The probe was pushed into the tar by hand until refusal. The penetration depth of the probe was noted and the location and relative elevation of the probe location was surveyed.

The February 1991 Work Plan for the investigation called for probing the tar through the ice. The Safety Plan for the investigation required that the ice thickness be at least 4-inches thick. The ice on the tar pit was approximately 1/2-inch thick. A 16-foot flat-bottomed boat was used, with one-end secured to the shore, for sampling. Hand Probe locations are shown in Figure 3. Table 1 summarizes the results of the hand probes.

Samples of tar (approximately 1/3 gallon each) were collected from three locations for compositing. The sampling locations are shown on Figure 3. The tar had to be slowly pried from the surface in order to obtain a sample. The samples were then composited into three 1-quart jars. Each 1-quart sample contained approximately 1/3 quart of each of the three tar samples. Chemical analysis was performed on one of the composited tar samples from the tar pit. Results of the tar analyses are summarized in Tables 2 and 3.

The ice auger was used to perform shallow borings in the vicinity of the tar pit. The auger was usable as long as the frost line was first penetrated with a pick-ax (approximately 3 inches) and the gravel content of the soil was low. The maximum depth of the shallow boreholes was approximately 3 feet. Large amounts of gravel tended to lock up the auger. All boreholes were surveyed for ground elevation and location. The locations of the shallow borings are shown in Figure 3. Logs of the shallow borings are summarized in Table 1.

Six shallow borings (B-1 to B-6) were augered south of the tar pit. Shallow boring B-1 is approximately 10 feet south of the tar pit edge and shallow boring B-6 is approximately 250 feet south of the tar pit edge. A hand soil sampler was used to collect soil samples from the bottom of the shallow boreholes.

Free tar of unknown thickness was found in borings B-1 through B-5. Rock "clinker" was found in B-6 but tar was not found. HNU readings in shallow borings B-1 through B-5 displayed some reading above background values. No HNU readings above background levels were noted in shallow boring B-6. The tar found in all of these southern borings appeared to be free-tar (i.e. very little sand or soil in the matrix). The augers could not penetrate the tar. The tar was typically ductile to fluid but highly viscous. The tar was found at a depth of about 2 feet in shallow borings B-1 through B-5. In boring B-5, the hand auger was easily pushed an additional foot into the soft, free tar. The water table was at about 1.5 to 2 feet below the ground surface.

Ten shallow boreholes were also made north and east of the tar pit within the site fence. Boreholes could not be made directly west of the tar pit because of a great deal of gravel and clinker in the soil. Shallow boring B-7, located northwest of the tar pit, was augered to a total depth of 3.1 feet. Water was encountered at 3 feet in shallow boring B-7. The soil was mostly cinders and sand. No tar was detected in shallow boring B-7 but an oily sheen was present on the water table. The HNU reading in the borehole was not above background concentrations.

Shallow boring B-8, located north of the tar pit, was augered to a total depth of 2.7 feet. Tar was found in a sand matrix at a depth of approximately 2.5 feet in B-8. The HNU reading in the borehole was 25 ppm above background levels.

Shallow boring B-9, also north of the tar pit, was to a depth of 2 feet. Free tar was noted at the bottom of the hole. The HNU reading in the borehole was 22 ppm above background levels.

Shallow boring B-10 was augered directly north of the tar pit, just inside the north fence. Brown sand was encountered to the bottom of the borehole (depth of 3 feet) with no evidence of tar. The water table was encountered at 1.8 feet. There was no HNU response in the borehole.

Shallow boring B-11 is located south of shallow boring B-10 and north of the tar pit. B-11 was augered to a depth of 1.8 feet with very difficult drilling due to rock and gravel. Water was encountered at 1.6 feet. There was no evidence of tar but there was a faint tarry odor. The HNU reading in the borehole was 3 ppm above background levels.

Shallow boring B-12 was located south and west of shallow boring B-11. B-12 was augered to a depth of 2 feet, through very gravelly sand. Tar mixed with sand and gravel was encountered at 1.8 feet in B-12.

Shallow boring B-13 was augered to a depth of 3.1 feet, through gravelly sand. There was no evidence of tar in the borehole. The HNU reading in the borehole was 4 ppm above background levels.

Shallow boring B-14 was augered to a depth of 3.1 feet, through "muddy" tar-like sand. The water table was encountered at a depth of 1.3 feet. No free tar was found in B-14 but an oil sheen was noticed on the water table. The HNU reading in the borehole was 4 ppm above background levels.

Shallow boring B-15 was augered to a depth of 1 foot. The soil was very rocky and could not be further penetrated. Water was encountered at a depth of approximately 0.5 feet. No tar was observed in B-15. The HNU reading from a hand-augered soil sample taken from the bottom of the auger gave a reading of 1 ppm above background levels.

Shallow boring B-16 was augered to a depth of 1.3 feet. Tar was encountered at the bottom of the borehole. The water table was encountered at approximately 1 foot. The HNU reading in the borehole was 100 ppm above background levels and a hand-cored sample gave a HNU reading of 85 ppm above background levels.

A cross section through several of the shallow borings and the hand probes of the tar pit is shown on Figure 4.

B. Phase II Investigation

The second phase of the Waukegan Tar Pit Site investigation was conducted March 25-29, 1991 to further evaluate the lateral and vertical extent of tar in the soil near the tar pit and also to evaluate the depth to the hardpan clay that was thought to underlie the site. A track-mounted drilling rig, operated by Exploration Technology, Inc., with a 4.5 inch I.D. hollow-stem auger was used to make 20 soil borings and collect continuous soil samples with a 2-foot long split-spoon sampler. Soil borings B-17 through B-35a ranged in depth between 12 and 30 feet. Samples were

described by visual observation and HNU screening. The locations of the borings are shown on Figure 3. Logs of these borings are in Appendix A.

Two composite samples of soil containing tar were made from soil samples collected in borings south of the tar pit and from samples collected in borings north of the tar pit. Table 4 identifies the boring number and depth of samples used to make the composite samples. These two composite samples, along with a sample from the tar pit, were analyzed for several chemical and physical properties and a TCLP leaching test was performed on the two composite samples and the tar sample. The results of these analysis are summarized in Tables 5-8. The laboratory report for these analyses are in Appendix B.

4. SITE GEOLOGY

The geology of the site is generally described as 2 to 10 feet of sand and gravel fill with debris overlying approximately 15 to 25 feet of well-sorted, well-rounded, gray, medium sand. Thin, discontinuous layers of gravel, gravelly sand, silt, and peat are present in the gray sand. Underlying the sand, at a depth of approximately 25 feet, is a gray, highly compacted clayey silt till, colloquially referred to as "hardpan".

The water table at the site was observed to be approximately 1 to 3 feet below the ground surface. During drilling of the boreholes, the water level in the boreholes stabilized very quickly, suggesting that the deposits underlying the site are highly permeable.

Several cross sections across the site were drawn using the data collected from the shallow borings, the tar pit probes, and the deep borings. The locations of these cross sections are shown on Figure 3. The cross sections are shown on Figures 4 through 8.

An old, thin root zone, consisting of wood fibers, laminated clay, and peat appears to extend under much of the site and separates the fill material

from the underlying gray sand. The configuration of the root zone is well illustrated in Cross-Section C-C' (Figure 5). Though discontinuous in some locations, this root zone can be correlated from borehole to borehole over a considerable distance. It is likely that this root zone represents the bottom of a pit that has been subsequently filled by sand and debris material.

South of the tar pit, broken gypsum-board material constitute a large portion of the fill material from the ground surface to a depth of 1 to 3 feet. South of the tar pit, near the east fence line, road-bed clinker gravel and cobbles are present in the fill mixed with sand and with the gypsum-board debris.

5. EVALUATION OF VERTICAL AND LATERAL EXTENT OF TAR

The vertical and lateral extent of tar at the site is evaluated on the basis of the shallow borings, the deep borings, and the hand probes of the tar pit. Boring logs are in Appendix A and cross sections, summarizing the correlation between borings are on Figures 4 through 8.

a. Vertical Extent of Tar

Almost all of the free tar at the site appears to be within the tar pit itself. Tar was found in many of the soil borings but was mostly present as a mixture of tar and sand. A few thin (less than 1-2 inches) layers of free tar were found in some of the borings. The soil boring logs and the cross sections summarize the location of tar found in the subsurface. Very thin (less than 1 inch) layers of hard tar were present in some locations north of the tar pit at the ground surface. These thin layers of hard tar are mostly less than a few square feet in area. It appears that this surficial tar has lost much of its fluidity and behaves most like a solid.

Thin layers of tar mixed with sand or gravel were noted at considerable depth in borings B-18, B-25, B-27, and B-29. In boring B-18, tar was found

on top of the clayey silt hardpan. It is likely that the tar, at one time, migrated downward via gravity.

Most of the tar that was mixed with sand or gravel in the borings was restricted to the upper 10 feet of soil. The tar material appeared to be partially filling the interstices of the sand and gravel. The former pit bottom soils, which consist of peat, clay, and silt, appears to have retarded the vertical movement of tar in the areas north and west of the tar pit.

In some of the soil borings, a low-viscosity, brown tarry substance fills the interstices of the sand and gravel, usually below a layer of sand and tar. North of the tar pit, the soil collected from the borings had a distinctive solvent-like odor and the interstitial fluid, imparted a sheen. The solvent-like odor and sheen was noted at all depths below the water table in most of the borings north of the tar pit.

b. Lateral Extent of Surficial Tar

Surficial tar is restricted to the area of the tar pit and a few thin, isolated occurrences of hard tar just north of the tar pit.

c. Lateral Extent of Sub-Surface Tar

Tar, mixed with sand or other soil material, was not observed in borings B-20, B-21, B-24, B-30, and B-35. Two 1/2-inch layers of tar were observed in the upper 2 feet of boring B-20. An oily coating was observed in the sand from depths of 2 to 8 feet in B-21 but tar material was not observed in B-21. Brown sand with an oily coating was also observed in boring B-24 but tar was not observed in B-24. A 1-inch layer of tar was observed in boring B-30 on top of a laminated clay layer and underlying gypsum debris but tar was not observed mixed with sand at any other depths in boring B-30. No tar material was observed in boring B-35.

6. RESULTS OF CHEMICAL ANALYSIS OF TAR AND SOIL

Various chemical and physical parameters were analyzed for samples of tar collected from the tar pit and from two composite samples of tar mixed with soil collected from the soil borings.

a. Analysis of Composited Tar Sample

A composite sample of tar collected February 27, 1991 from the three locations in the tar pit was analyzed for volatile organic compounds using EPA Method 8010/8020 (Modified), and for semi-volatile organic compounds using EPA Methods 8270 and 8100. The composite sample consisted of approximately of 30% of samples TS-1, TS-2, and TS-3. The locations where these samples were taken from the tar pit are shown on Figure 3.

The results of the analysis of the composited tar sample are shown in Table 2 and Table 3. The results indicate that the tar is composed of 2 to 3 percent naphthalene and approximately 5 to 10 percent total polyaromatic hydrocarbon (PAH) compounds.

b. Analysis of Composite Soil Samples and Tar Sample

Two soil samples, composited from samples collected in the soil borings performed in March 1991, and a tar sample (TS-3) collected from the western portion of the tar pit, were analyzed for volatile, semi-volatile organic compounds and metals. The composite soil samples were made from samples collected from the borings which appeared to contain tar. Table 2 lists the borings and collection depths of the samples used to make the two composite soil samples. The soil sample composites were prepared by compositing equal portions of the most visibly contaminated soils. The composite sample Comp-2 represents the worst-case soils from the area north and west of the tar pit and composite sample Comp-1 represents the worst-case soils from the area south of the tar pit. The results of the analyses are summarized in Tables 5-8. The laboratory report and description of analytical methods are in Appendix B. The results of additional physical test results for flash point,

specific gravity, and BTU content are shown in Table 9. The results of the flash-point test for tar sample TS-3 and for the composite soil samples are greater than 200°F. This flash-point data is consistent with the higher flash-point data from previous investigations. These data are higher than the single low flash-point value reported in a previous investigation.

Small concentrations of arsenic, chromium and lead were detected in the composited soil samples and small concentrations of lead were detected in tar sample TS-3. The concentrations of arsenic chromium and lead are well within the range of naturally occurring concentrations in soil.

c. TCLP Analyses of Composite Soil Sample and Tar Sample

The EPA Toxic Characteristic Leaching Procedure (TCLP) was employed on the two composite soil samples and tar sample TS-3. The results of the TCLP analyses are summarized in Table 5. The laboratory report for the TCLP analyses are in Appendix B.

Benzene was found to leach at concentrations above the TCLP regulatory limit. The reported value for benzene of 14.0 mg/l exceeded the TCLP regulatory limit of 0.5 mg/L in tar sample TS-3. The reported values for benzene for the two worst-case composite soil samples were 3.5 and 2.4 mg/l and exceeded the TCLP regulatory limit.

7. EXTENT OF TAR REMOVAL

Consistent with the National Contingency Plan ("NCP"), the tar pit investigation was scoped as a removal action to respond to an emergency and time-critical situation. In EPA's words,

> [R]emovals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively address all threats at a site. Consequently, removal actions cannot be expected to attaim all ARARs.
>
> (1990 Ammendments to NCP, EPA comments on new section 300.415(i), "Removal action compliance with other laws," p. 92)

The tar pit investigation addresses the two matters identified by EPA as needing mitigation and/or stabilization, namely (1) endangerment to wildlife from becoming entrapped in tar, and (2) spontaneous combustion of low flash-point tarry materials. Two potentially hazardous materials phases are identified from the site investigation: (1) free tar within the tar pit and (2) thin laminae of tar in the soil and tar in interstices of the soil. As explained below, free tar removal responds to both EPA-identified concerns.

The free tar within the tar pit and the water on top of the tar within the tar pit represent imminent hazards to the environment because the pit water is attractive to wildlife, especially birds and because the tar has been demonstrated to be a potential fire hazard. Wildlife approaching the water in the tar pit have become entrapped in the tar during warm periods.

The site is now surrounded by a fence with a locked gate. The fence restricts access by humans and wildlife. The flagging that is now strung across the pit appears to be deterring birds from landing on the water within the pit.

The tar mixed with soil in the vicinity of the tar pit is located below the ground surface and is not generally accessible to wildlife or humans and does not pose a danger of spontaneous combustion. The results of the TCLP analyses do indicate that the soil/tar mixture is hazardous with respect to benzene. However, in terms of emergency action, the soil/tar mixture does not warrant immediate removal.

The medium which represents an immediate hazard to human health and the environment is the exposed tar within the tar pit and, secondarily, small amounts of less-fluid free tar at the ground surface north of the tar pit. The surface water within the tar pit is accessible to wildlife and likely contains elevated levels of volatile organic compounds. The water within the tar pit should also be removed.

Removing the tar and water within the pit and surficial tar north of the pit constitutes appropriate emergency action to mitigate any immediate hazard to human health and the environment at the Waukegan Tar Pit Site.

8. ESTIMATION OF TAR VOLUME

The volume of tar in the tar pit was estimated from the results of the hand probes of the tar pit. The area of the tar pit was divided up into areas of equal depth, based on the hand probe results. The total volume of tar in the tar pit is estimated to be approximately 1,300 cubic yards. The specific gravity of the tar is estimated to be 1.185. The estimated weight of the tar in the tar pit is approximately 2.6 million pounds (1,300 tons).

9. EVALUATION OF REMOVAL AND DISPOSAL TECHNOLOGIES

This section of the report describes the technically feasible removal and disposal technologies for the free tar removal action. Handling and on-site processing needs for the removal action are also described.

a. Removal

Two technologies are considered technically feasible for use in the removal of the free tar from the surficial tar pit. These technologies include vacuum extraction by pumping and mechanical excavation by a backhoe. The free tar can be removed through vacuum extraction by applying a suction from a pump to lift the tar from the surficial tar pit to a vacuum truck. This technology can only be applied during frost-free months and can best be applied from mid-to-late summer when the temperature of the surficial tar is highest. The best pumping access points are located on the south and west sides of the tar pit. Mechanical means may be required to assist in moving tar from portions of the tar pit to the pumping locations.

The tar removal could also be accomplished through a mechanical excavation by using a backhoe. The best time for mechanical excavation with a backhoe would be mid-winter to excavate the tar primarily as a solid or

semi-solid. The winter tar excavation would require a backhoe capable of ripping through the frozen or semi-solid tar material. Mechanical excavation would require a long reach (30 to 40 feet) backhoe. Mechanical excavation may also be possible in mid-to-late summer through excavation of the tar primarily as a flowable fluid. For the summer mechanical excavation the free tar would be ladled from the pit using a wide, smooth backhoe bucket.

b. Disposal

The following disposal options have been identified as technically feasible for disposal of the free tar from the tar removal action:

1. Hazardous waste incinerator as a liquid or solid.
2. Hazardous waste landfill as a solid.
3. Hazardous waste fuel blending program as a liquid or solid.
4. Management as a "special waste", subject to the Bevill Ammendment, RCRA paragraphs 3001(b)(2)(3)(Aii,III).
5. Possible combinations of 1 through 4.

c. On-Site Handling and Processing

On-site handling and processing will be required to handle the material removed and to process the material for shipment to a disposal facility. The specific procedures will depend on the final disposal option or combination of options, method of removal, and the time of year during which the removal action is conducted. The processing of the surficial tar pit water may include on-site oil/water separation and treatment by the North Shore Sanitary District. Processes such as separation of liquids and solids, or stabilization of the semi-solid tar as a solid and/or the storage of the excavated process materials on-site may be necessary to facilitate cost effective removal and disposal of the free tar.

TABLES

Table 1

Summary of Borings and Probes
(February 1991)

1. Shallow Borings

Shallow soil borings were augured using a gas-powered ice auger with a 3.5 foot long, 6-inch diameter auger. The top 3 inches of soil was typically frozen and had to be broken with a pick ax prior to auguring. A 2-inch diameter hand auger was used to retrieve samples from the bottom of the augured borehole. Ground surface elevation referenced relative to manhole top at northeast corner of site - assigned arbitrary datum of 100 feet.

Boring B-1

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	101.7 feet
Total Depth:	2.8 feet
Depth to Water:	2.2 feet
Tar Present?	yes - soft tar
Depth to Top of Tar:	2 feet

Boring B-2

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	101.1 feet
Total Depth:	2.8 feet
Depth to Water:	2.5 feet
Tar Present?	yes - soft tar
Depth to Top of Tar:	2.5 to 2.8 feet (exact top uncertain)

Boring B-3

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	100.6 feet
Total Depth:	2.5 feet
Depth to Water:	2.0 feet
Tar Present?	yes - soft tar
Depth to Top of Tar:	2.5 feet

Boring B-4

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	100.0 feet
Total Depth:	2.0 feet
Depth to Water:	1.5 feet
Tar Present?	yes - soft tar
Depth to Top of Tar:	2.0

Table 1 (cont.)

Boring B-5

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	99.3 feet
Total Depth:	2.4 feet
Depth to Water:	0.4 feet
Tar Present?	yes - soft tar
Depth to Top of Tar:	2.3 feet (tar is at least 1 inch thick)

Boring B-6

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	102.0 feet
Total Depth:	1.9 feet
Depth to Water:	no water encountered
Tar Present?	no
Depth to Top of Tar:	N/A
Comment:	black clinker and cinders encountered at 1.7 ft

Boring B-7

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	101.7 feet
Total Depth:	3.1 feet
Depth to Water:	3.0 feet
Tar Present?	no
Depth to Top of Tar:	N/A
Comment:	oily sheen on surface of water; HNU response in borehole was not above background levels; soil is cinders mixed with sand

Boring B-8

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	99.8 feet
Total Depth:	2.7 feet
Depth to Water:	no water in hole
Tar Present?	yes - mixed with sand
Depth to Top of Tar:	approx. 1 foot
Comment:	HNU reading in borehole was 25 ppm

Table 1 (cont.)

Boring B-9

Date of Boring:	2/27/91
Rel. Ground Surface Elevation:	99.0 feet
Total Depth:	2.0 feet
Depth to Water:	no water in borehole
Tar Present?	yes - tar mixed with sand at bottom of hole
Depth to Top of Tar:	@ 2 feet
Comment:	HNU reading of 22 ppm at bottom of hole

Boring B-10

Date of Boring:	2/28/91
Rel. Ground Surface Elevation	99.4 feet
Total Depth:	3.0 feet
Depth to Water:	1.8 feet
Tar Present?	no
Depth to Top of Tar:	N/A
Comment:	brown sand at all depths; no HNU response in borehole; good drillability; no odor

Boring B-11

Date of Boring:	2/28/91
Rel. Ground Surface Elevation	99.6 feet
Total Depth:	1.8 feet
Depth to Water:	1.6 feet
Tar Present?	no
Depth to Top of Tar:	N/A
Comment:	No HNU response in borehole; 3 ppm HNU reading on cuttings; very gravelly sand; no visible tar; faint tarry odor

Boring B-12

Date of Boring:	2/28/91
Rel. Ground Surface Elevation	99.9 feet
Total Depth:	2.0 feet
Depth to Water:	no water in borehole
Tar Present?	yes - mixed with sand and gravel
Depth to Top of Tar:	1.8 feet

Table 1 (cont.)

Boring B-13

Date of Boring:	2/28/91
Rel. Ground Surface Elevation:	100.4 feet
Total Depth:	3.1 feet
Depth to Water:	no water in borehole
Tar Present?	no
Depth to Top of Tar:	N/A
Comments:	gravelly sand; HNU reading in borehole was 4 ppm

Boring B-14

Date of Boring:	2/28/91
Rel. Ground Surface Elevation:	99.5 feet
Total Depth:	3.1 feet
Depth to Water:	1.3 feet
Tar Present?	no
Depth to Top of Tar:	N/A
Comment:	sand is very dark; water has oily sheen; hand-auger core gives HNU reading of 3 ppm

Boring B-15

Date of Boring:	2/28/91
Rel. Ground Surface Elevation:	99.5 feet
Total Depth:	1 foot
Depth to Water:	0.5 feet
Tar Present?	no
Depth to Top of Tar:	N/A
Comment:	very gravelly soil with cobbles; HNU reading of hand-augured core was 1 ppm levels;

Boring B-16

Date of Boring:	2/28/91
Rel. Ground Surface Elevation:	99.2 feet
Total Depth:	1.3 feet
Depth to Water:	1 foot
Tar Present?	yes
Depth to Top of Tar:	1.2 feet
Comment:	HNU reading in borehole was 100 ppm; HNU reading of hand augured core was 85 ppm

Table 1 (cont.)

2. Hand Probes of Tar Pit

Hand probes were used to attempt to estimate the depth of tar in the tar pond. A 3/4-inch diameter galvanized pipe was pushed into the tar until refusal. The depth of water above the tar at all probe locations was 0.5 feet. All penetration depths are measured from the top of the tar surface.

Probe P-1

Penetration Depth:	2.1 feet
Rel. Elevation of Top of Tar:	98.4 feet

Probe P-2

Penetration Depth:	0.3 feet (soft tar underlain by hard tar)
Rel. Elevation of Top of Tar:	98.5 feet

Probe P-3

Penetration Depth:	0.3 feet (soft tar underlain by hard tar)
Rel. Elevation of Top of Tar:	98.4 feet

Probe P-4

Penetration Depth:	no penetration - hard tar
Rel. Elevation of Top of Tar:	98.6 feet

Probe P-5

Penetration Depth:	1.1 feet (soft tar underlain by hard tar)
Rel. Elevation of Top of Tar:	98.4 feet

Probe P-6

Penetration Depth:	1.8 feet (soft tar underlain by hard tar)
Rel. Elevation of Top of Tar:	98.4 feet

Table 1 (cont.)

Probe P-7

Penetration Depth:	1.3 feet (soft tar)
Rel. Elevation of Top of Tar:	98.3 feet

Probe P-8

Penetration Depth:	0.2 feet (soft tar - underlying material is unknown)
Rel. Elevation of Top of Tar:	98.5 feet

Probe P-9

Penetration Depth:	2.7 feet of soft tar
Rel. Elevation of Top of Tar:	98.5 feet

Probe at Sample Site TS-3

Penetration Depth:	1.6 feet of soft tar
Rel. Elevation of Top of Tar:	98.5 feet

TABLE 2

WAUKEGAN TAR PIT SITE
VOLATILE ORGANIC COMPOUNDS
(FEBRUARY 1991)

(concentrations in mg/kg)

	WAUKEGAN TAR SAMPLE	METHOD BLANKS	
EPA Method SW8010/8020 (MOD)	02/27/91	02/27/91	02/27/91
1,1,1-Trichloroethane	<50	<0.0010	<0.050
1,1,2,2-Tetrachloroethane	<50	<0.0010	<0.050
1,1,2-Trichloroethane	<50	<0.0010	<0.050
1,1-Dichloroethane	<50	<0.0010	<0.050
1,1-Dichloroethene	<50	<0.0010	<0.050
1,2-Dichlorobenzene	<50	<0.0010	<0.050
1,2-Dichloroethane	<50	<0.0010	<0.050
1,2-Dichloropropane	<50	<0.0010	<0.050
1,3-Dichlorobenzene	<50	<0.0010	<0.050
1,4-Dichlorobenzene	<50	<0.0010	<0.050
Benzene	140	<0.0010	<0.050
Bromodichloromethane	<50	<0.0010	<0.050
Bromoform	<50	<0.0010	<0.050
Bromomethane	<50	<0.0010	<0.050
Carbon Tetrachloride	<50	<0.0010	<0.050
Chlorobenzene	<50	<0.0010	<0.050
Chloroethane	<50	<0.0010	<0.050
Chloroform	<50	<0.0010	<0.050
Chloromethane	<50	<0.0010	<0.050
Dibromochloromethane	<50	<0.0010	<0.050
Dichloromethane (Methylene chloride)	<50	<0.0010	<0.050
Ethylbenzene	100	<0.0010	<0.050
Tetrachloroethene	<50	<0.0010	<0.050
Toluene	220	<0.0010	<0.050
Trichloroethene	<50	<0.0010	<0.050
Trichlorofluoromethane	<50	<0.0010	0.60
Vinyl Chloride	<50	<0.0010	<0.050
Xylenes (Total)	420	<0.0010	<0.050
cis-1,3-Dichloropropene	<50	<0.0010	<0.050
tert-Butyl methyl ether	<50	<0.0010	<0.050
trans-1,2-Dichloroethene	<50	<0.0010	<0.050
trans-1,3-Dichloropropene	<50	<0.0010	<0.050
Total BETX [1]	880	ND	ND

1 Sum of Benzene, Ethylbenzene, Toluene and Xylenes.
ND None Detected.

TABLE 3

WAUKEGAN TAR PIT SITE
SEMI-VOLATILE ORGANIC COMPOUNDS
(FEBRUARY 1991)

(concentrations in mg/kg)

	WAUKEGAN TAR SAMPLE		LAB BLANKS	
EPA Method	SW8270	SW8100		
	02/27/91	02/27/91	02/27/91	02/27/91
N-Nitrosodimethylamine	<2900	--	<0.33	--
Phenol	<2900	--	<0.33	--
Aniline	<2900	--	<0.33	--
bis(2-Chloroethyl)Ether	<2900	--	<0.33	--
2-Chlorophenol	<2900	--	<0.33	--
1,3-Dichlorobenzene	<2900	--	<0.33	--
1,2-Dichlorobenzene	<2900	--	<0.33	--
Benzyl Alcohol	<2900	--	<0.33	--
1,2-Dichlorobenzene	<2900	--	<0.33	--
2-Methylphenol	<2900	--	<0.33	--
bis(2-Chloroisopropyl)Ether	<2900	--	<0.33	--
4-Methylphenol	<2900	--	<0.33	--
N-Nitroso-di-n-propylamine	<2900	--	<0.33	--
Hexachloroethane	<2900	--	<0.33	--
Nitrobenzene	<2900	--	<0.33	--
Isophorone	<2900	--	<0.33	--
2-Nitrophenol	<2900	--	<0.33	--
2,4-Dimethylphenol	<2900	--	<0.33	--
Benzoic acid	<14000	--	<1.6	--
bis(2-Chloroethoxy)Methane	<2900	--	<0.33	--
2,4-Dichlorophenol	<2900	--	<0.33	--
1,2,4-Trichlorobenzene	<2900	--	<0.33	--
Naphthalene	27000	18000	<0.33	<0.050
4-Chloroaniline	<2900	--	<0.33	--
Hexachlorobutadiene	<2900	--	<0.33	--
4-Chloro-3-Methylphenol	<2900	--	<0.33	--
2-Methylnaphthalene	14000	6000	<0.33	<0.050
Hexachlorocyclopentadiene	<2900	--	<0.33	--
2,4,6-Triclorophenol	<2900	--	<0.33	--
2,4,5-Trichlorophenol	<14000	--	<0.33	--
2-Chloronaphthalene	<2900	--	<0.33	--
2-Nitroaniline	<14000	--	<1.6	--
Dimethyl Phthalate	<2900	--	<0.33	--
Acenaphthylene	8400	4200	<0.33	<0.050
2,6-Dinitrotoluene	<2900	--	<0.33	--
3-Nitroaniline	<14000	--	<1.6	--
Acenaphthene	1000 j	340 jx	<0.33	<0.050
2,4-Dinitrophenol	<14000	--	<1.6	--
4-Nitrophenol	<14000	--	<1.6	--
Dibenzofuran	700 j	--	<0.33	--
2,4-Dinitrotoluene	<2900	--	<0.33	--
Diethylphthalate	<2900	--	<0.33	--
4-Chlorophenyl-phenylether	<2900	--	<0.33	--
Fluorene	5600	2700	<0.33	<0.050
4-Nitroaniline	<14000	--	<1.6	--
4,6-Dinitro-2-methylphenol	<14000	--	<1.6	--
N-Nitrosodiphenylamine	<2900	--	<0.33	--
1,2-Diphenylhydrazine	<2900	--	<0.33	--
4-Bromophenyl-phenylether	<2900	--	<0.33	--
Hexachlorobenzene	<2900	--	<0.33	--

TABLE 3 (cont.)

WAUKEGAN TAR PIT SITE
SEMI-VOLATILE ORGANIC COMPOUNDS
(FEBRUARY 1991)

(concentrations in mg/kg)

	WAUKEGAN TAR SAMPLE		LAB BLANKS	
	02/27/91	02/27/91	02/27/91	02/27/91
Pentachlorophenol	<14000	--	<0.33	--
Phenanthrene	16000	7000	<0.33	<0.050
Anthracene	4300	1400	<0.33	<0.050
Di-n-Butylphthalate	<2900	--	<0.33	--
Fluoranthene	5300	2100	<0.33	<0.050
Benzidine	<14000	--	<1.6	--
Pyrene	8500	4300	<0.33	<0.050
Butylbenzylphthalate	<2900	--	<0.33	--
3,3'-Dichlorobenzidine	<5800	--	<0.66	--
* Benzo(a)anthracene	3800	1200	<0.33	<0.050
* Chrysene	4300	1300	<0.33	<0.050
bis(2-Ethylhexyl)phthalate	<2900	--	<0.33	--
Di-n-octylphthalate	<2900	--	<0.33	--
* Benzo(b)fluoranthene	1300 j	510	<0.33	<0.050
Benzo(k)fluoranthene	1700 j	930	<0.33	<0.050
* Benzo(a)pyrene	2900	1100	<0.33	<0.050
* Indeno(1,2,3-cd)pyrene	1100 j	330 jx	<0.33	<0.050
* Dibenz(a,h)anthracene	<2900	<400	<0.33	<0.050
* Benzo(g,h,i)perylene	1200 j	630	<0.33	<0.050
Sum of Carcinogenic PAHs	15000	5100	ND	ND
Total PAHs	110000	52000	ND	ND

---

j Reported value is less than detection limit.
jx Detected, concentration estimated.
ND None Detected.

Table 4

Summary of Composite Tar Samples for Analysis

Composite Sample	Individual Samples: Boring	Individual Samples: Approximate Depth
Comp-1 (north and west of pit)	B-21	@ 11′
	B-22	4 - 6′
	B-23	@ 14′
	B-25	@ 8′
	B-26	@ 9′
	B-27	@ 8′
Comp-2 (south of pit)	B-28	@ 4′
	B-29	@ 4′
	B-29	5 - 6′
	B-31	@ 4′
	B-31	@ 7′
	B-35A	5.3 -6′
TS-3	(tar pit sample from west side of pit)	

TABLE 5

WAUKEGAN TAR PIT SITE
TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP) PARAMETERS
AND REGULATORY LEVELS
(MARCH 1991)

(concentrations in mg/L)

	REGULATORY LEVEL (1)	TS-3	COMP-1	COMP-2
TCLP Metals		03/27/91	03/29/91	03/29/91
Asrsenic	5	<0.010	<0.010	0.016
Barium	100	<0.20	0.28	0.26
Cadmium	1	<0.005	<0.005	<0.005
Chromium	5	<0.010	<0.010	<0.010
Lead	5	<0.10	<0.10	<0.10
Mercury	0.2	<0.0002	<0.0002	<0.0002
Selenium	1	<0.025	<0.025	<0.025
Silver	5	<0.010	<0.010	<0.010
TCLP Volatiles				
Benzene	0.5	14	3.5	2.4
2-Butanone (MEK)	200	<0.050	0.21	<0.010
Carbon Tetrachloride	0.5	<0.25	<0.050	<0.050
Chlorobenzene	100	<0.25	<0.050	<0.050
Chloroform	6	<0.25	<0.050	<0.050
1,2-Dichloroethane	0.5	<0.25	<0.050	<0.050
1,1-Dichloroethene	0.7	<0.25	<0.050	<0.050
Tetrachloroethene	0.7	<0.25	<0.050	<0.050
Trichloroethene	0.5	<0.25	<0.050	<0.050
Vinyl Chloride	0.2	<0.50	<0.10	<0.10
TCLP Semi-Volatiles				
Cresol (Total)	200	1.8	0.15	0.026
1,4-Dichlorobenzene	7.5	<0.020	<0.020	<0.020
2,4-Dinitrotoluene	0.13	<0.020	<0.020	<0.020
Hexachlorobenzene	0.13	<0.020	<0.020	<0.020
Hexachlorobutadiene	0.5	<0.020	<0.020	<0.020
Hexachloroethane	3	<0.020	<0.020	<0.020
Nitrobenzene	2	<0.020	<0.020	<0.020
Pentachlorophenol	100	<0.020	<0.020	<0.020
Pyridine	5	<0.10	<0.10	<0.10
2,4,5-Trichlorophenol	400	<0.020	<0.020	<0.020
2,4,6-Trichlorophenol	2	<0.020	<0.020	<0.020

(1) From: Federal Register, Vol. 55, No. 61, March 29, 1990, p. 11804

TABLE 6

WAUKEGAN TAR PIT SITE
SEMI-VOLATILE ORGANIC COMPOUNDS
(MARCH 1991)

(concentrations in mg/kg)

	TS-3	COMP-1	COMP-2
	03/27/91	03/29/91	03/29/91
2,3-Benzofuran	<80	<30	<150
2,3-Dihydro-1H-Indene	<80	20 j	240
1H-Indene	5700	44	180
Naphthalene	32000	360	2000
Benzo(b)thiophene	800	11 j	55 j
Isoquinoline	<80	<30	<150
2-Methylnaphthalene	11000	150	950
Indole	<80	<30	<150
1-Methylnaphthalene	9400	140	850
Biphenyl	2000	26 j	130 j
Acenaphthylene	7400	38	78 j
Acenaphthene	800	84	500
Dibenzofuran	580	8.6 j	49 j
Fluorene	4500	58	280
Dibenzothiophene	2300	20 j	140 j
Phenanthrene	14000	160	800
Anthracene	4400	59	270
Acridine	<80	<30	<150
Phenanthridine	<80	<30	<150
Carbazole	<80	3.3 j	<150
Fluoranthene	5000	64	240
Pyrene	7600	95	400
Triphenylene	3000 c	40 c	150 c
Benzo(k)fluoranthene	2200 c	28 jc	88 jc
7,12-Dimethylbenz(a)anthracene	<80	<30	<150
Benzo(e)pyrene	1100	15 j	46 j
Perylene	360	4.9 j	15 j
3-Methylcholanthrene	<80	<30	<150
* Quinoline	<80	<30	<150
* Benzo(a)anthracene	3100	41	140 j
* Chrysene	3000 c	40 c	150 c
* Benzo(b)fluoranthene	2200 c	28 jc	88 jc
* Benzo(a)pyrene	2300	28 j	89 j
* Indeno(1,2,3-cd)pyrene	680	7.8 j	22 j
* Dibenz(a,h)anthracene	<80	3.1 j	<150
* Benzo(g,h,i)perylene	770	9.1 j	26 j
Sum of Carcinogenic PAHs	6800-12000	110-160	380-520
Total PAHs	120000	1500	7700

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c Compounds coelute.
j Reported value is less than quantitation limit.
* Carcinogenic PAH compounds.

TABLE 7

WAUKEGAN TAR PIT SITE
VOLATILE ORGANIC COMPOUNDS
(MARCH 1991)

(concentrations in mg/kg)

	TS-3	COMP-1	COMP-2
	03/27/91	03/29/91	03/29/91
Chloromethane	<7.8	<3.8	<12
Bromomethane	<7.8	<3.8	<12
Vinyl Chloride	<7.8	<3.8	<12
Chloroethane	<7.8	<3.8	<12
Methylene Chloride	5.7 jb	2.8 jb	9.3 j
Acetone	8.9 b	14	51
Carbon Disulfide	<3.9	<1.9	<6.2
Trichlorofluoromethane	<3.9	<1.9	<6.2
1,1-Dichloroethene	<3.9	<1.9	<6.2
1,1-Dichloroethane	<3.9	<1.9	<6.2
1,2-Dichloroethene (total)	<3.9	<1.9	<6.2
Chloroform	<3.9	<1.9	<6.2
1,2-Dichloroethane	<3.9	<1.9	<6.2
2-Butanone	6.0 j	<3.8	<12
1,1,1-Trichloroethane	<3.9	<1.9	<6.2
Carbon Tetrachloride	<3.9	<1.9	<6.2
Vinyl Acetate	<7.8	<3.8	<12
Bromodichloromethane	<3.9	<1.9	<6.2
1,2-Dichloropropane	<3.9	<1.9	<6.2
cis-1,3-Dichloropropene	<3.9	<1.9	<6.2
Trichloroethene	<3.9	<1.9	<6.2
Dibromochloromethane	<3.9	<1.9	<6.2
1,1,2-Trichloroethane	<3.9	<1.9	<6.2
Benzene	79	5.1	21
trans-1,3-Dichloropropene	<3.9	<1.9	<6.2
2-Chloroethylvinylether	<7.8	<3.8	<12
Bromoform	<3.9	<1.9	<6.2
2-Hexanone	<7.8	<3.8	<12
4-Methyl-2-Pentanone	<7.8	<3.8	<12
Tetrachloroethene	<3.9	<1.9	<6.2
1,1,2,2-Tetrachloroethane	<3.9	<1.9	<6.2
Toluene	130	12	26
Chlorobenzene	<3.9	<1.9	<6.2
Ethylbenzene	65	39	140
Styrene	91	<3.1	<6.2
Xylenes (total)	130	40	150
1,3-Dichlorobenzene	<3.9	<1.9	<6.2
1,4-Dichlorobenzene	<3.9	<1.9	<6.2
1,2-Dichlorobenzene	<3.9	<1.9	<6.2
Acrolein	<78	<38	<120
Iodomethane	<3.9	<1.9	<6.2
Acrylonitrile	<78	<38	<120
Dibromomethane	<3.9	<1.9	<6.2
Ethyl Methacrylate	<3.9	<1.9	<6.2
1,2,3-Trichloropropane	<3.9	<1.9	<6.2
Trans-1,4-Dichloro-2-Butene	<3.9	<1.9	<6.2
Sum of BETX*	400	96	340

j Reported value is less than quantation limit.
b Potential false positive value based on data validation procedures.
* Benzene, Ethyl Benzene, Toluene, Xylene.

TABLE 8

WAUKEGAN TAR PIT SITE
TOTAL METALS AND OTHER INORGANIC COMPOUNDS
(MARCH 1991)

(concentrations in mg/kg)

	TS-3	COMP-1	COMP-2
	03/27/91	03/29/91	03/29/91
Silver	<2.5	<2.7	<2.6
Arsenic	<2.5	7.5	8.5
Barium	<51	<54	<51
Cadmium	<1.3	<1.3	<1.3
Chromium	<2.5	8.2	16
Mercury	<0.12	<0.10	<0.09
Nickel	<10	<11	<10
Lead	10	17	15
Selenium	<1.3	<1.3	<1.3
pH, standard units	7.9	7.0	7.2
Cyanide	<0.001	<0.001	<0.001
Sulfide	<0.05	<0.05	<0.05

TABLE 9

WAUKEGAN TAR PIT SITE
PHYSICAL PARAMETERS
(MARCH 1991)

	TS-3	COMP-1	COMP-2
	03/27/91	03/29/91	03/29/91
Heat of Combustion, BTU/lb.	15000	<150	<150
Density, g/ml	1.185	1.552	1.590
Flash Point, degrees F	>200	>200	>200
Per Cent Ash	16	58	64

FIGURES

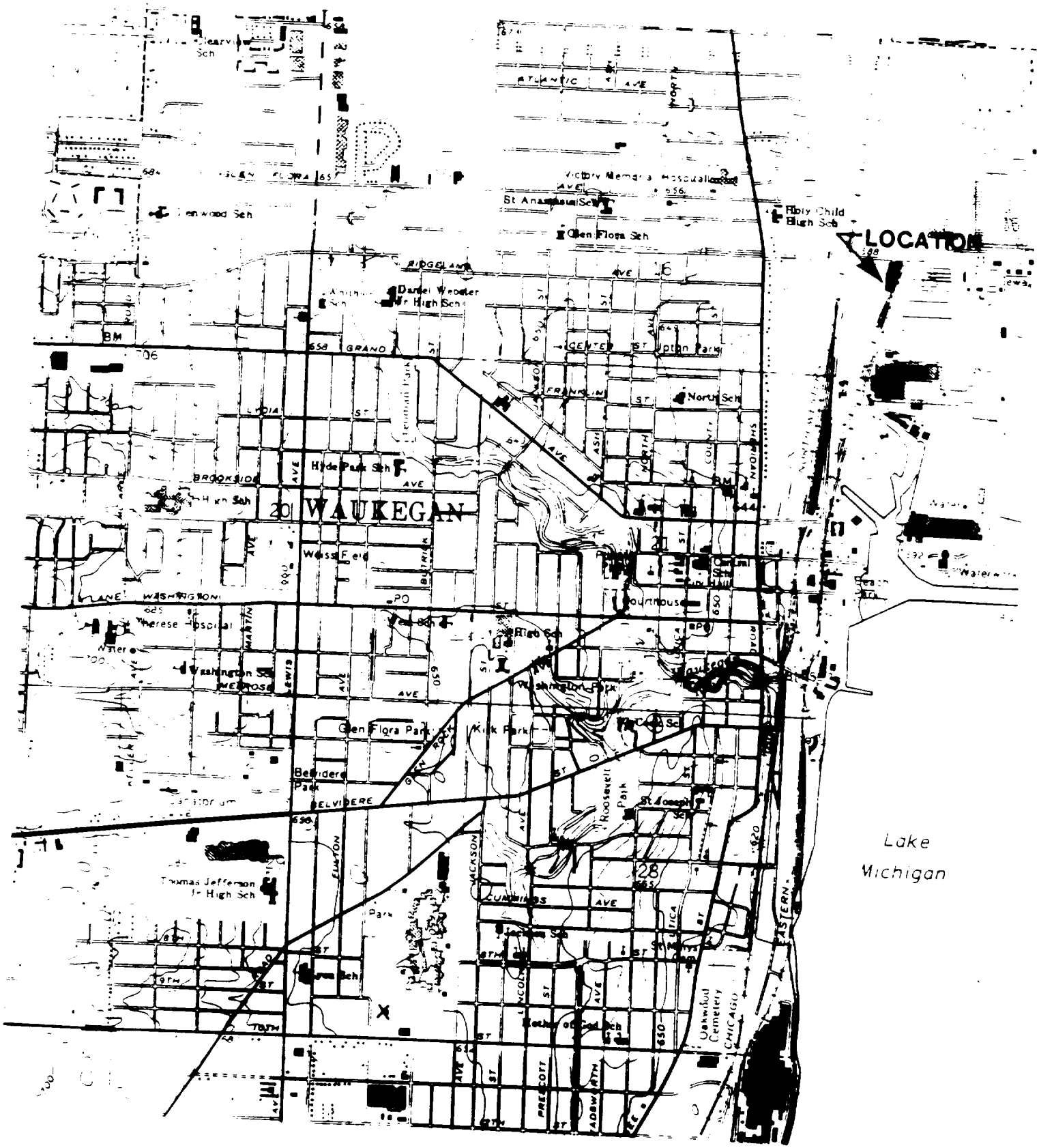
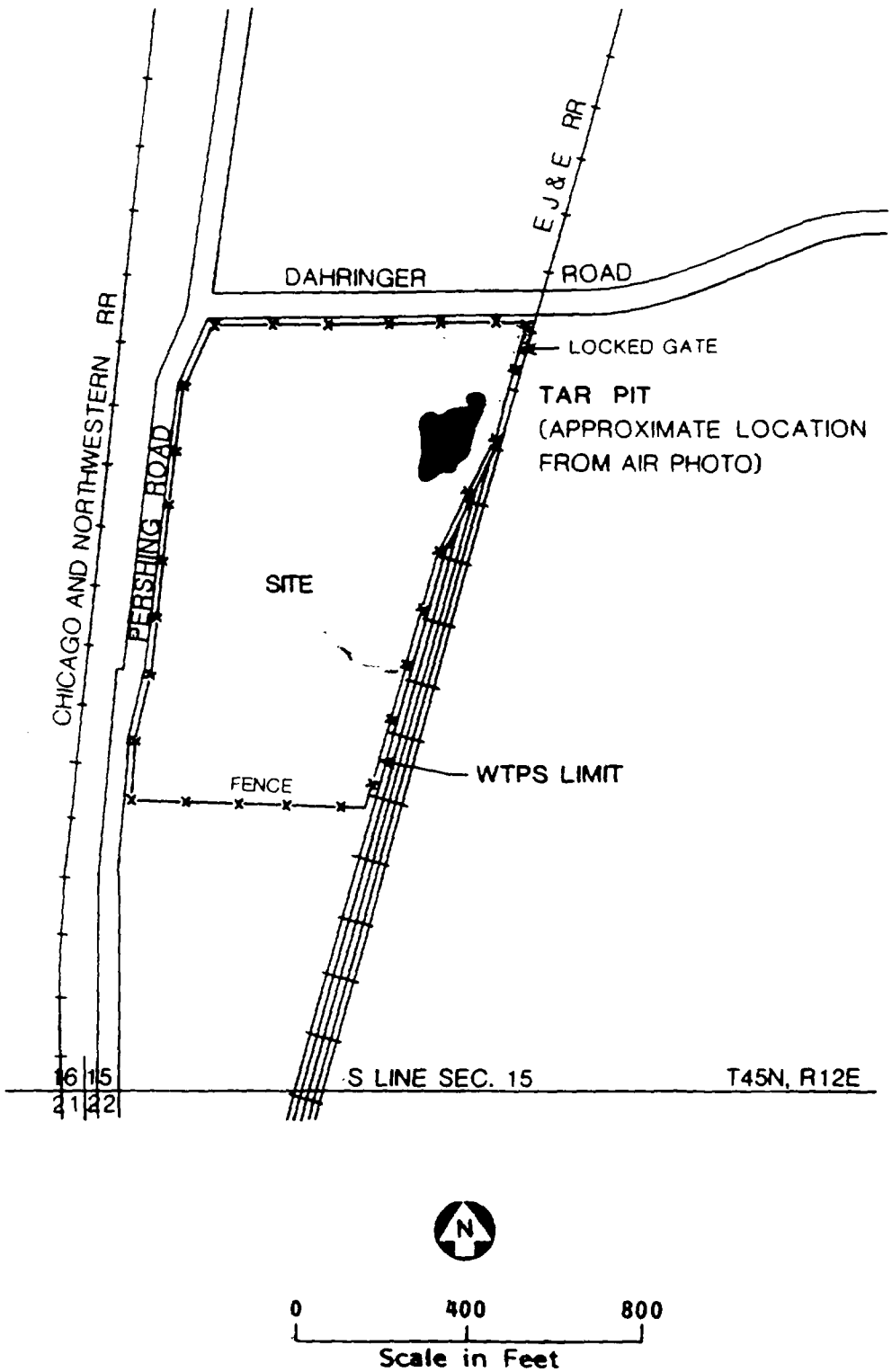


Figure 1

Waukegan Tar Pit Site
LOCATION MAP



Chain Link Fence
(Approximate Location)

Figure 2

Waukegan Tar Pit Site
MAP OF IMMEDIATE VICINITY AND TAR PIT

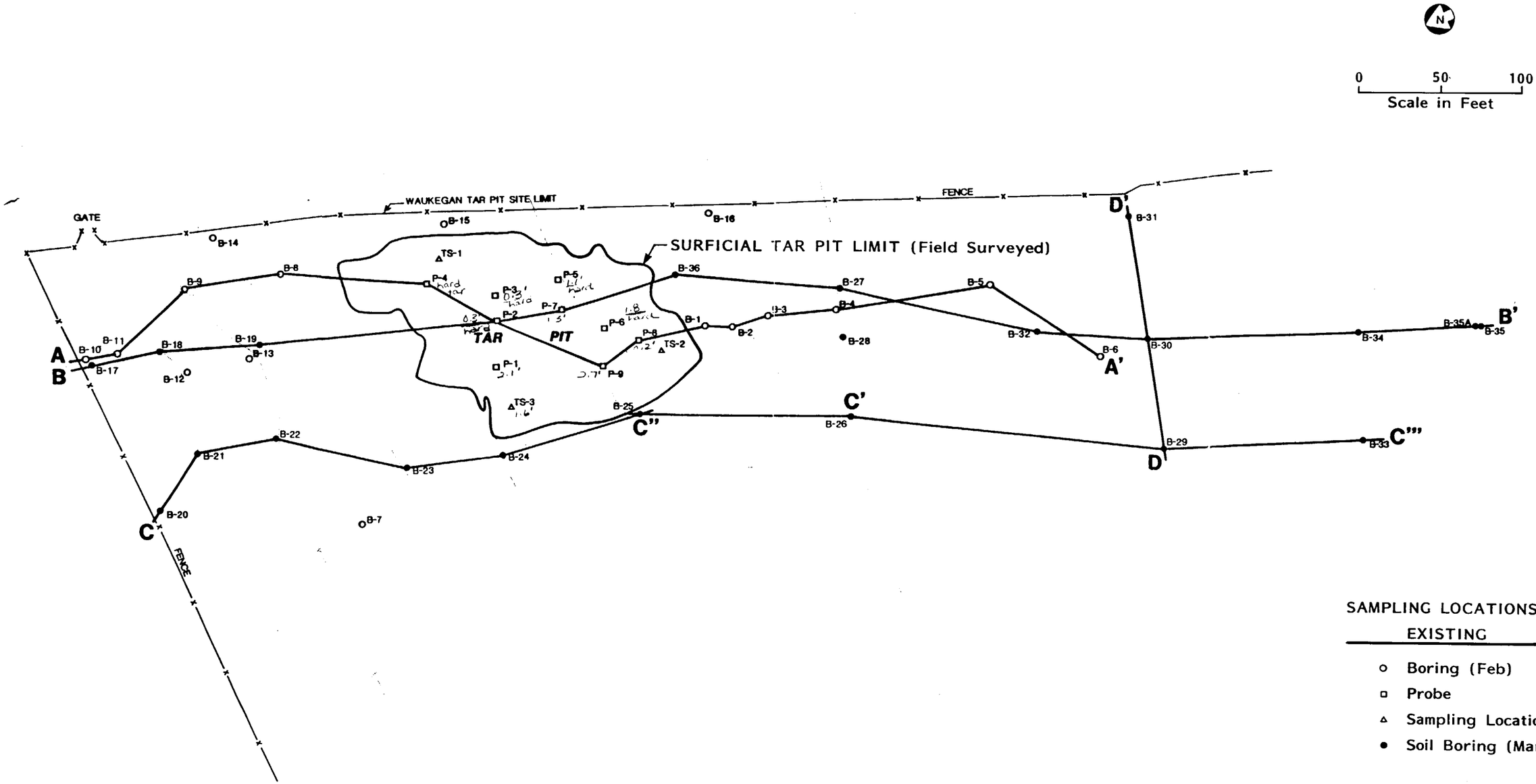


Figure 3

LOCATION MAP OF
SOIL BORINGS, TAR PROBES,
AND CROSS SECTIONS

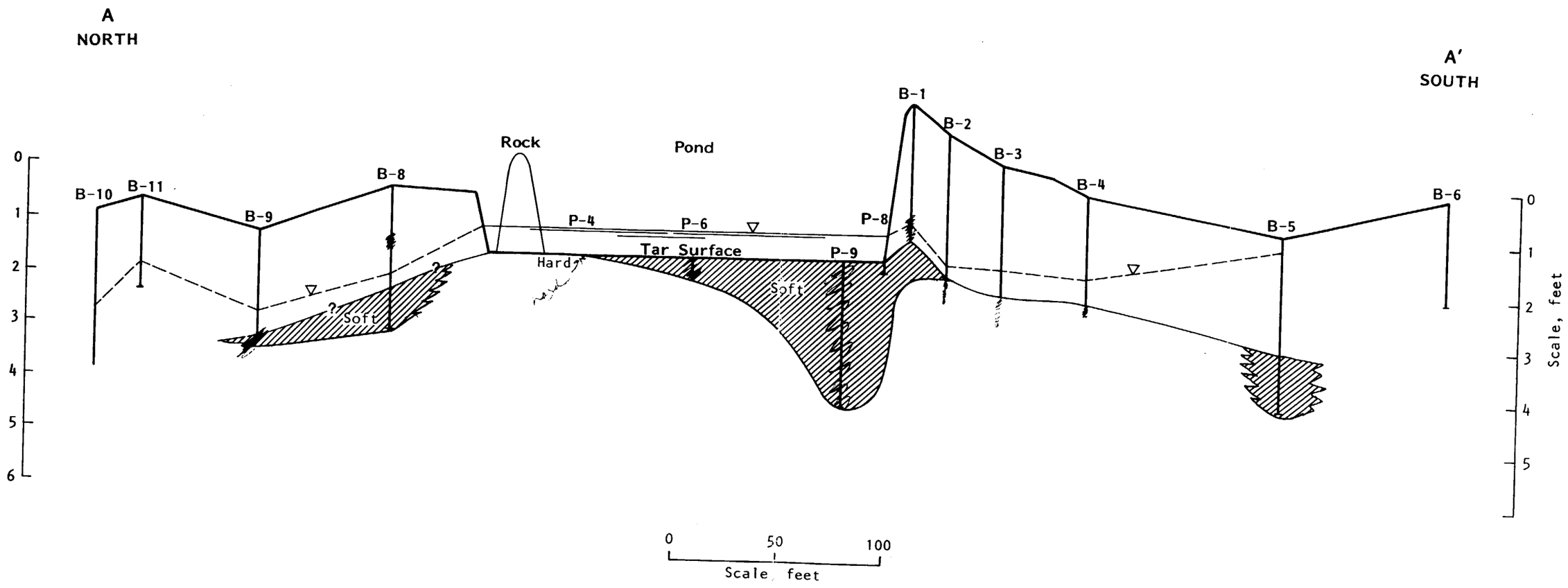


Figure 4
CROSS SECTION A-A'

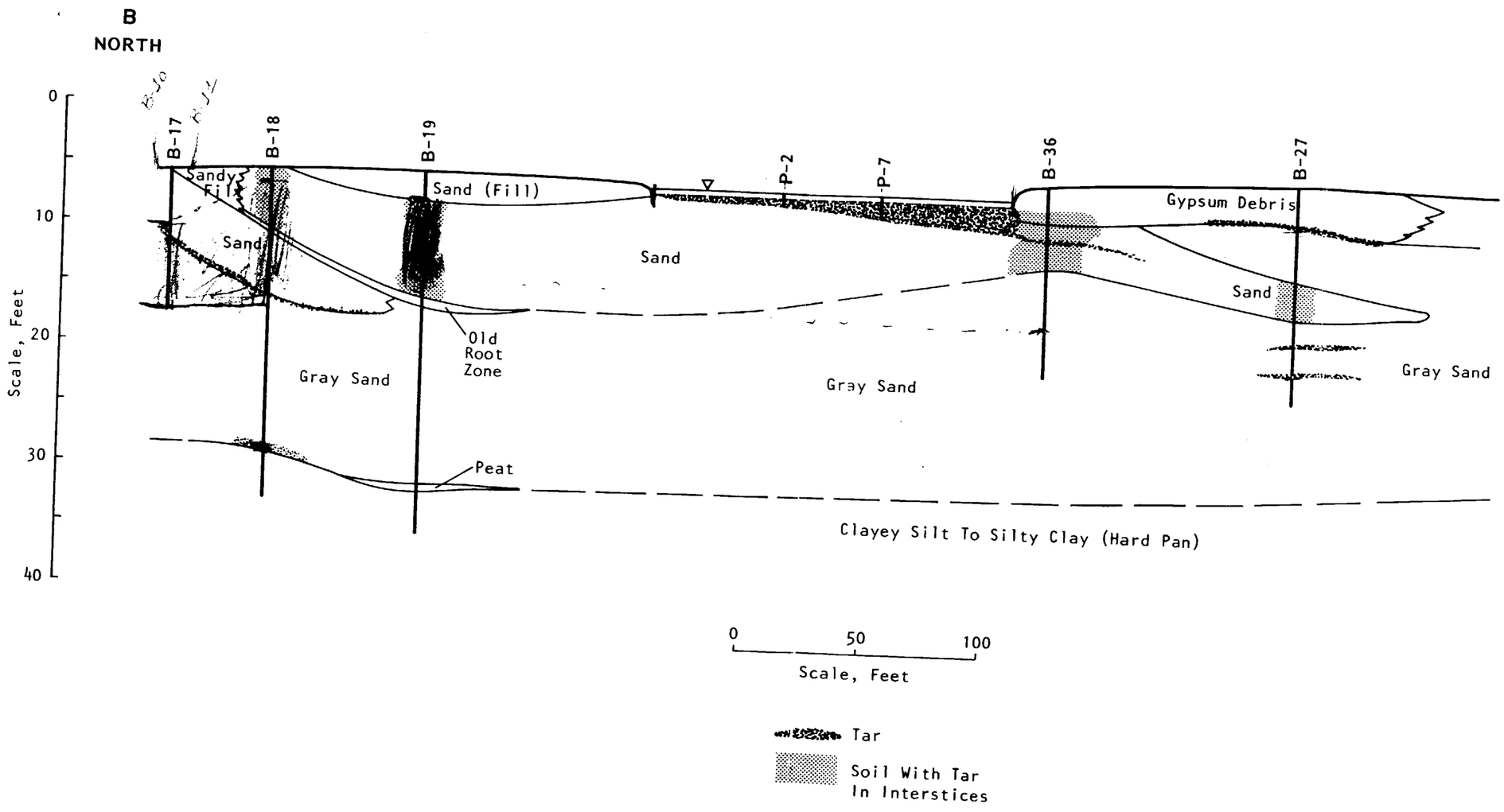


Figure 5a
CROSS SECTION B-B'
(North Part)

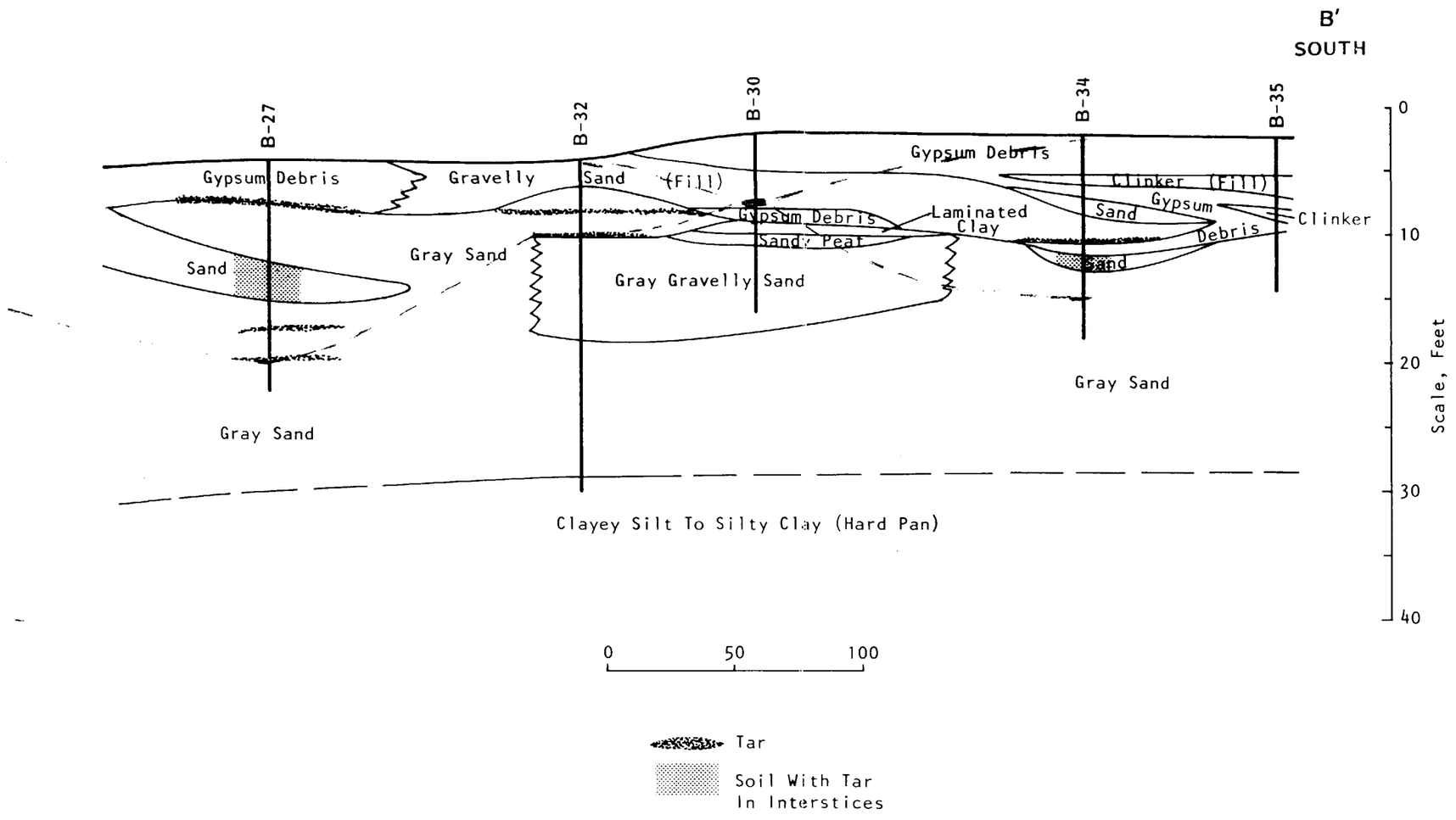


Figure 5b

CROSS SECTION B-B'
(South Part)

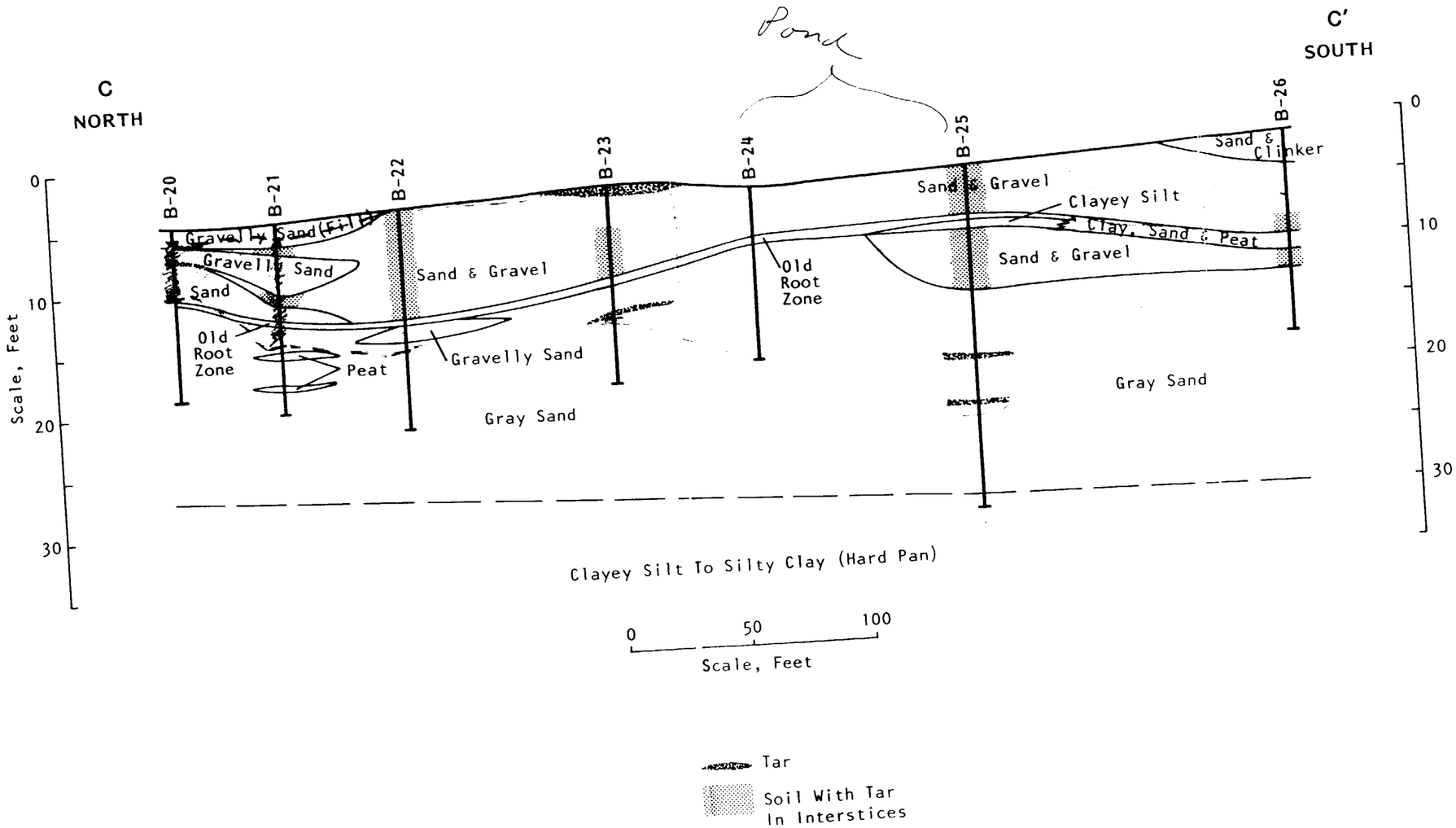


Figure 6
CROSS SECTION C-C'

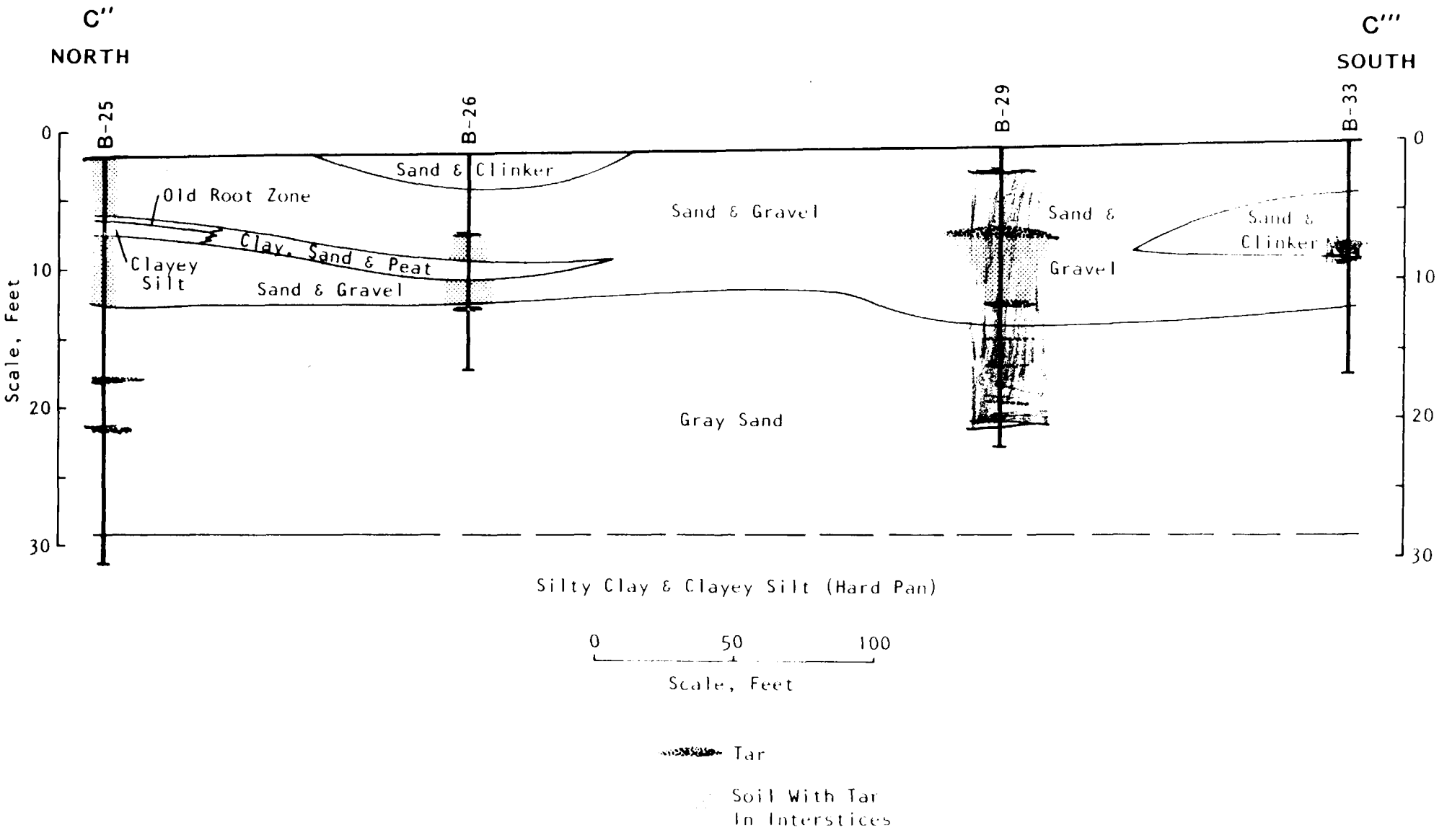


Figure 7

CROSS SECTION C'' C'''

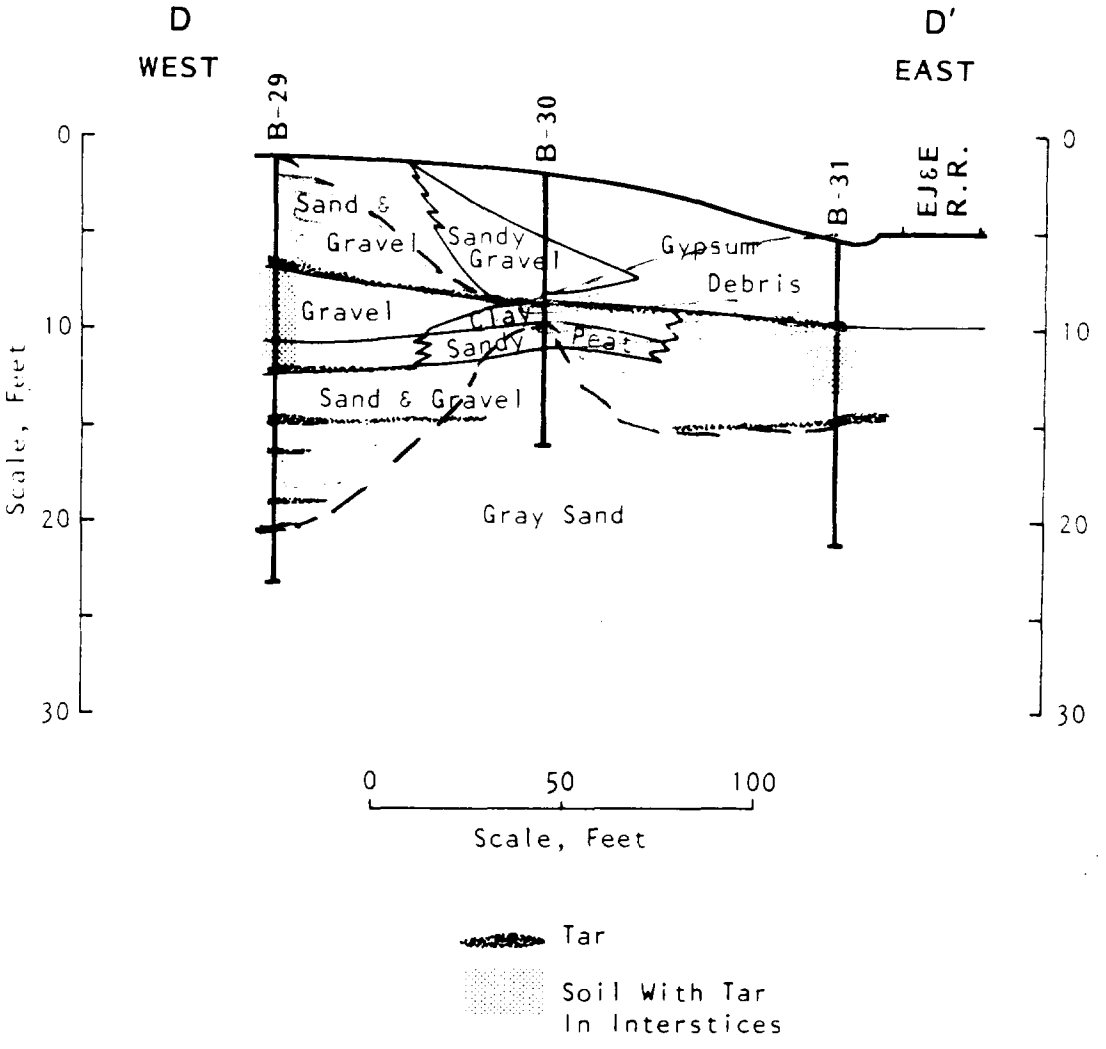


Figure 8
CROSS SECTION D-D'

APPENDIX A
BORING LOGS

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 2-26-91
DATE COMPLETED: 3-26-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-17
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 99.4

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
		CS	50%	dry to moist	0ppm		0.0-0.2 Brown sandy topsoil 0.2-1.4 Dark brown sandy silt 1.4-1.7 Tan sand slightly cohesive Continuous sampling abandoned due to poor recovery.
	2 1 1 1	SS	50%	wet	NA		Brown sand, no tar
5							
	2 1 1 1	SS	5%	wet	NA		Sand with black tar in pores, oil sheen, strong tar odor (slight solvent odor)
	1 0 0 0	SS	0%	wet	NA		No recovery -cuttings-have dark oily sheen-sand odor is that of gasoline or a solvent
	0 50-NA	SS	NA	wet	NA		Same as above, bottom inch is very strongly cemented sandy gravel- the gravel is very angular white to buff material (sample), no visible sheen or coloration
10							
	11 14 8 21	SS	NA	wet	NA		Fine to medium, gray to brown silty sand some tarry sand (very minor tar at 12.0)- maybe in groundwater. Minor tar odor (slight solvent odor).
							Augering stopped at 11.5'- auger going crooked
15							
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-26-91
DATE COMPLETED: 3-26-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-18
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 99.7

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	2 4 17 20	SS	100%	dry	4ppm		0.0-1.1 Brown gravelly sand 1.1-2.0 Tar mixed with 20% sand-free tar (sample)
	15 7 5 5	SS	80%	moist wet	4ppm		50% tar 50% sand and gravel
5	4 3 3 0	SS	20%	moist	35ppm		Top 1-2" is soft, free tar with some sand Bottom 3-4" is silty sand with clay, tar, rootlets-tar coats inside surface of sand
	2 3 4 5	SS	50%	wet	30ppm		Brown sand with very low viscosity brown fluid in interstices-oily sheen, solvent-like odor
	5 4 6 10	SS	100%	wet	4ppm		Same as above with oily sheen, no free tar-solvent-like odor
10	8 10 38 36	SS	100%	wet	0ppm		10.0-10.7 tan sand 10.7-11.1 semi-soft free tar w/some sand 11.1-12.0 tan sand
							No sample recovered
	15 17 19 27	SS	100%	wet	1-2ppm (maybe ex-haust)		Tan sand, 5% pea gravel some sheen but relatively clean-no tar
15							
		No Samples					Runny fine gray sand (clear to brownish gray, no sheen in water coming up auger-can't sample)
20							Augers flushed with water to remove blow-out
	12 19 24 39	SS	20%	moist			Some tar residue at top of hardpan (<1" thick) gray clay with angular limestone pebbles-very stiff, considerable silt content
25	20 53 43 41	SS	20%	moist	1ppm		Same as above (no tan)
							E.O.B. 27.5'
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-26-91
DATE COMPLETED: 3-26-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-19
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 99.8

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	1 1 1 7	SS	90%	moist	0ppm		0.0-0.3 Topsoil 0.3-1.4 Tan-gray sand 1.4-2.0 Mashed plant fibers with a faint tar odor
	2 5 8 3	SS	60%	moist	4ppm		2.0-2.6 Soft brown sandy gravel 2.6-4.0 Sandy gravel with tar
5	1 1 1 2	SS	40%	moist	7ppm		4.0-4.4 Brown sand with some tar 4.0-4.6 Soft tar with sand
	0 0 2 1	SS	30%	moist	7ppm		6.0-6.2 Brown sand 6.2-? Black sand with a tar-like material in the interstices
	3 7 8 6	SS	80%	moist	20ppm		8.0-9.0 Same as 6.2? 9.0-10.0 Much cleaner tan sand
10	5 5 6 15	SS	100%	wet	3ppm		10.0-10.6 Cohesive brown sandy gravel with wood fibers 10.6-12.0 Brown to gray sand with much oil sheen in pore water
	8 8 13 17	SS	100%	wet	20ppm		12.0-12.6 Tan-gray sand 12.6-13.1 Brown silty sand, gravel 13.1-14.0 Same as 12.0-12.6, pore water has oily sheen, solvent-like odor
15	8 8 9 13	SS	100%	wet	10ppm		Same as 13.1-14.0 (<5% pea gravel) some brwon staining at 15.1 oily sheen, solvent-like odor
	15 12 15 20	SS	100%	wet	5ppm		Same as above
	15 18	SS	100%	wet	<1ppm		Same as above
20							No sample recovered
	6 13 18 20	SS	100%	wet	0ppm		Fine gray sand (same as above)
	7 9 9 16	SS	60%	wet	1ppm		Same as above
25	15 16 18 22	SS	50%	wet	1ppm		Same as above- @ 3% pea gravel
	14 18 26 40	SS	50%	wet	1ppm		Gray silty clay with limestone/chert pebbles and some fibrous peat
	14 31 42 17	SS	100%	moist	1ppm		Gray stiff clay and silt thoughout E.O.B. 30'
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-27-91
DATE COMPLETED: 3-27-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-20
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 100.1

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	2 2 3 5	SS	100%	dry	0ppm		0.0-0.4 Topsoil 0.4-2.0 Brown coarse sand 1/2" layer of tar at 1.1&2.0
	3 3 2 2	SS	50%	wet	<1ppm		Same as above, with no tar, but has a faint solvent-like odor
5	1 1 0 1	SS	60%	wet	05ppm		Dark gray gravelly sand tar-like to sovent-like odor some of the interstitial liquid is black
	0 0 0 2	SS	80%	wet	2ppm		Same as above 5.8-6.0 Is a gray-black silt with wood fibers and a faint tar-like odor
10	0 0 0 1	SS	70%	wet	1ppm		8.0-9.0 gray gravelly sand 9.0-10.0 gray sandy gravel, faint tar-like odor
	1 0 0 0	SS	70%	wet	<1ppm		10.0-11.3 Gray fine sand No visible tar sheen on pore water 11.3-12.0 Gray gravelly sand solvent-like odor.
	1 0 2 7	SS	70%	wet			Gray gravelly sand, faint solvent-like odor, no visible tar or coating on soil grains
15							E.O.B. 14'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-26-91
DATE COMPLETED: 3-27-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-21
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 100.2

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	1 2 3 4	SS	90%	dry	NA		0.0-1.4 Brown to tan gravelly sand 1.4-2.0 Black sand with tar odor
	4 12 13 9	SS	50%	wet	NA		2.0-2.6 Same as 1.4-2.0 2.6-2.8 Red gravelly sand 2.8-3.1 Gray oily gravel with pieces of cilinder and a solvent-like odor
5	2 4 3 1	SS	10%	wet	NA		Black gravelly sand with an oily to solvent-like odor
	2 1 1 4	SS	20%	wet	2ppm		6.0-6.3 Black sandy gravel with tar odor, possibly some free tar or oil-soaked sand 6.3-6.5 Brown gravelly sand
	2 9 6	SS	80%	wet	3ppm		8.0-8.4 Black, sandy, gravelly, with numerous wood fibers, oily 8.4-10.0 Gray sand with minor gravel, pore water has a sheen
10	7						
	3 3 7 13	SS	90%	wet	15-20 ppm (peat)		Gray fine sand at 11.0' there is a 2" peat layer (sample)
	11 8 3 39	SS	100%	wet	0ppm		Same as above, 1/2" thick peat layer at 13.0'
15	13 15 23 25	SS	100%	wet	0.5 ppm		Same as above, pore water has oil sheen
							E.O.B. 16.0'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-26-91
DATE COMPLETED: 3-26-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-22
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 100.9

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	2 4 6 10	SS	60%	dry	0ppm		0.8 Brown sand with streaks of tar 0.8-1.3 Black, crumbly tar with cinders and debris
	4 3 4 5	SS	70%	dry	4ppm		Gravelly sand (brown) mixed with tar (in pores)
5	4 4 4 2	SS	50%	wet	20ppm		Medium brown sand with oily tar
	3 2 1 1	SS	20%	wet	15ppm		Same as above
	5 5 4 10	SS	50%	wet	6ppm		8.0-9.0 Same as above with some debris and oily water in pores 9.0-9.4 gray fine sand
10	3 4 3 7	SS	100%	wet	10ppm		10.0-10.6 Oily, brown, gravelly sand 13.2-14.0 Brown, very oily sand, shiny with a solvent-like odor
	10 9 23 57	SS	100%	wet	20ppm		12.0-13.2 Gray, gravelly sand 10.6-12.0 Fine gray sand, pore water has oily sheen
15	12 15 13 20	SS	100%	wet	16ppm		14.0-15.8 Gray gravelly sand, chunks of rubber at 15.0 feet 15.8-16.0 Same as above, but with petroleum- like odor, brown
	14 9 10 13	SS	50%	wet	1ppm		Gray sand, some oil sheen, no tar or staining; some rubber pieces E.O.B. 16.0'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-23
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 101.7

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	2 4 4 18	SS	50%	dry	1ppm (tar)		0.0-0.5 Hard tar 0.5-1.0 Clean looking gravelly sand
	5 12 14 15		65%	wet	4ppm		2.4 -3.0 Gravel 3.0-4.0 Hard tan mixed with gravel (sample)
5	3 1 0 1		50%	wet	5ppm		5.0-6.0 Tar-gravel mix
	1 1 0 1		40%	wet	20ppm		7.5 Tar and peat-like material with rootlets (sample)
	4 4 3 7	SS	60%	wet	45ppm		8.8-9.5 Black sandy gravel 9.5-10.0 Black to dark gray sand
10							
	5 6 8 8	SS	90%	wet	6ppm		10.0 Black sandy gravel with traces of tar 11.0 Gray, oily, sandy
	6 3 5 13	SS	100%	wet	2ppm (sand) 50ppm (black sand)		12.0-13.6 Gray sand 13.6-14.0 Black to dark gray sand
15	8 10 16 17	SS	100%	wet	6ppm		2' of gray sand E.O.B. 16.0'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-27-91
DATE COMPLETED: 3-27-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-24
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 101.1

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	3 3 3 4	SS	80%	dry	0ppm		Black gravelly sand with much clinker
	3 2 1 2	SS	30%	moist	NA		Same as above with some wood fragments
5	1 3 3 5	SS	70%	moist to wet	NA		4.0-4.7 Same as above with rootlets throughout 4.7-4.9 Gray fine to medium sand with brownish liquid, some sheen and a solvent-like odor.
	3 3 3 4	SS	70%	wet	6ppm		Gray sand with oil sheen-brown oily droplets thoughout 6.9-1" layer of brown oily sand, also at 7.3', some minor (< 1/2") oily layers
10	0 3 5 8	SS	100%	wet	25ppm		8.0-9.2 Same as above 9.2-9.4 Brown oily sand 9.4-9.6 Gray sand with oil 9.6-10.0 Brown oily sand
	4 4 5 9	SS	100%	wet	20ppm brown sand		Gray sand with oil sheen and droplets of brown oil 11.8-12.0 Brown oil-stained sand (washed hole)
	4 6 11 16	SS	100%	wet	20ppm brown sand		Same as above 13.0-13.4 Brown sand as described above, some thin layers of brown silt E.O.B. 14.0'
15							
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-25
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 102.0

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	3 5 7 10	SS	100%	dry	0		Gravel-clayey and silty
	1 1 2 2	SS	75%	dry	1ppm		2.0-3.7 Clayey silt 4.0 Black -peat like material, slight odor (sample)
5	3 4 6 4	SS	80%	wet	10ppm		4.0-5.0 Clayey silt 6.0 Hard tar and gravel (sample)
	2 2 4 4	SS	50%	wet	6ppm		6.0-7.0 No recovery 7.0-7.3 Clayey silt and rock 7.3-8.0 Black tar, sand, gravel (sample)
10	3 4 6 7	SS	100%	wet	3ppm top 20 ppm		8.0-8.8 Clayey silt with some tar 8.8-10.0 Sandy tar (sample)
	5 11 13 16	SS	100%	wet	35ppm top 3ppm		10-11.3 Sandy tar continued 11.3-12.0 Light gray sand
	4 5 9 12	SS	100%	wet	20ppm (at 13.0)		12.0-12.8 Sand continued 12.8-13.3 Tar-sand-gravel mix (sample) 13.3-14.0 Light gray sand
15	5 7 19 24	SS	100%	wet	20ppm (at15.8)		14.0-15.5 Gray sand 15.6-15.9 Tar and sand 16.0 Gray sand
	10 13 18 21	SS	100%	wet	1ppm		Gray sand
20	7 11 15 18	SS	60%	wet	20ppm (tar)		2 foot blow gray sand to 19.5 19.5 has tar (sample) to 19.8
	6 12 18 19	SS	60%	wet	1ppm		Gray sand
	7 12 17 18	SS	60%	wet	2ppm		Same as above
25	5 7 7 32	SS	100%	wet	1ppm		Light oily film Same as above
	12 10 9 12	SS			<1ppm		Same as above 27.5-28.0 Clay- gray hand pan
30							E.O.B. 28'

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-26
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 103.2

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	1 2 2 3	SS	75%	dry	0ppm		2'-Sandy Fill-clinker
	5 6 6 6	SS	25%	wet	0ppm		Fill-sand, silty and gravel
5	3 3 3 4	SS	75%	wet	0ppm		Fill-clay to gravel
	0 2 1 1	SS	60%	wet	20ppm		6.0-7.5 Silt, some mixed with tar 7.5-8.0 Balck, sand (sample) (picture-4)
	2 4 5 8	SS	100%	wet	25ppm		8.5 Brown clayey silt 8.5-9.5 Sandy peat w/tar (sample) 9.5-10.0 Gray sand
10	2 3 4 7	SS	100%	wet	40ppm		Gray, sand w/some tar Some clay and silt @ 10.5, mixed with tar (sample)
	5 7 17 20	SS	100%	wet	7ppm		Gray sand
15	6 8 13 15	SS	100%	wet	1ppm		Same as above
							E.O.B. 16'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-27
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 101.0

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	1 0 1 1	SS	100%	dry	0ppm		0.0-2.0 Gypsum, white to buff, w/fragments of gypsum board
	2 1 1 1	SS	50%	wet	3ppm		2.0-3.0 Gypsum (same as above) 3.0 Tar (sample)
5	0 0 0 0	SS	25%	wet	1ppm		Black to dark gray sand
	0 0 1 3	SS	25%	wet	50ppm		8.0 Sandy tar (sample)
	3 6 8 6	SS	90%	wet	18ppm		8.5 Sandy tar 9.0 Black sand 10.0 Tar and sand
10	3 4 7 12	SS	60%	wet	20ppm 2ppm @ 11.0		10.0-11.0 Black sand and tar 11.5-12.0 No sample recovered
	4 5 9 12	SS	100%	wet	10ppm		12.0-13.0 Black sand 13.0-13.2 Tar 13.2-14.0 Black sand
15	5 4 4 7	SS	75%	wet	6ppm (tar)		14.0-14.5 No sample recovered 14.5-15.5 Black sand (sample) 15.5 Tar
	5 7 9 12	SS	50%	wet	5ppm		16.0-17.0 Gray sand 2' Blow in
20							E.O.B. 18'
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-28
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 100.6

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	1 0 0 2	SS	60%	dry	0ppm		1.5-2.0 Gypsum , black fill-sandy gravel to gravelly sand
	1 2 1 1	SS	75%	wet	9ppm		2.0-3.0 Brown silt 3.0-4.0 Tar (sample)
5	0 0 0 3	SS	50%	wet	60ppm		5.0-5.5 Brown, clay-like fill 5.5-6.0 Black, sandy tar (sample)
	1 2 5 5	SS	80%	wet	30ppm		6.0-6.5 Brown, clay-gypsum mix 6.5-8.0 Black, sandy silt (sample) (picture 5)
10	3 4 5 9	SS	100%	wet	22ppm		8.0-9.0 Black sand 9.0-10.0 Tar and gravel (sample)
	2 4 4 7	SS	80%	wet	13ppm		10.0-11.0 Black sand 11.0-11.5 Black, tar, gravel 11.5-12.0 Black sand
	7 6 11 15	SS	100%	wet	20ppm		12.0-14.0 Black sand, with an oily film some gravel in the middle
15	7 8 10 14	SS	100%	wet	14ppm		14.0-16.0 Same as above
	11 10 12 17	SS	100%	wet	20ppm		Same as above
20							E.O.B. 18'
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-29
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 103.8

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	0 2 3 2	SS	90%	dry	0ppm		0,0-1.0 Fill, sand and gravel 1.0-2.0 Fine coarse sand
	3 5 15 19	SS	100%	wet	1ppm		2.0-3.5 Gray silty sand 3.5-4.0 Hard black gravelly sand (sample)
5	3 5 6 3	SS	55%	wet	0ppm		Tar in toe of split spoon Black silty gravelly sand (sample)
	11 7 3 2	SS	75%	wet	10 ppm		6.0-7.0 Hard tar 7.0-8.0 Soft tar mixed with gravel (sample)
10	5 4 8 11	SS	75%	wet	7ppm 5ppm sand		8.0-9.0 Gravel (may have tar) (sample) 9.0-10.0 Black sand
	3 8 6 12	SS	100%	wet	20 ppm tan 60ppm		10.0-10.3 Brown sandy gravel with silt 10.3-10.7 Tar (sample) (picture-6) 10.7-12.0 Black, sand (oily)
	12 7 8 16	SS	100%	wet	20-60 ppm		Black sand, with tar at 13.0 trace tar at 13.5 (sample)
15	15 9 13 20	SS	100%	wet	20ppm		14.0-15.2 Black sand 15.2 Tar-sand (sample)
	19 13 21 23	SS	100%	wet	20ppm		16.0-17.5 Black sand and gravel 17.5-17.7 Black sand and tar (sample) 17.7-18.0 Black sand
20	14 12 14 19	SS	50%	wet	3ppm		2.5' Blow-in 18.0-19.0 No recovery 19.0-20.0 Gray sand, may have chuck tar (sample)
	9 8 12 16	SS	75%	wet	2ppm		Blackish-gray sand (picture 7)
25							E.O.B. 22'
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-27-91
DATE COMPLETED: 3-27-91
FIELD INSPECTOR: Ray Wuolo (BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-30
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 103.0

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	0 0 0 0	SS	60%	dry	0ppm		0.0-0.1 Topsoil white conglomeration of broken gypsum board pieces and clayey gypsum board residue
	0 1 4 3	SS	75%	dry	0ppm		2.0-3.0 White crushed gypsum 3.0-3.7 Brown to black sandy gravel, no hydrocarbon smell
5	2 1 2 2	SS	50%	wet	0ppm		4.0-4.3 White gypsum, may be slough from above 4.3-5.0 Brown to black sandy gravel, no odor
	1 0 0 2	SS	90%	moist	3ppm (tar)		6.0-6.4 Gypsum 6.4-6.6 Free soft tar 6.6-7.5 Layered brown to olive clay (fine laminations indicative of lacustrine deposits) 7.6-8.0 Sandy peat with wood fibers
	3 3 5 7	SS	50%	wet	0ppm		Gray to black sand with rootlets 8.0-9.0 Fain hydrocarbon odor
10							
	2 4 5 18	SS	80%	wet	0ppm		10.0-11.0 Dark gray gravelly sand 11.0-11.4 Dark gray sandy gravel 11.4-11.6 Dark gray gravelly sand No odor (or only very fain odor)
	3 4 12 11	SS	70%	wet	0-1 ppm		Same as above
15							E.O.B. 14'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-29-91
DATE COMPLETED: 3-29-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-31
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 99.7

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	0 1 4 3	SS	50%	dry	1ppm		Broken gypsum board material with a trace of tar
	3 4 5 4	SS	20%	wet	5ppm		Gypsum board material with some tar (sample)
5	3 4 5 5	SS	50%	wet	40 ppm 5ppm (in hole)		4.4 Tar 5.0-5.4 Tar with sand (sample)
	3 1 2 4	SS	90%	wet	35ppm		Black sand-tar (sample) (picture-8) tar at 7.0
10	5 4 9 14	SS	100%	wet	30ppm		Black sand with traces of tar at 9.0'
	6 8 11 15	SS	100%	wet	25ppm		Same as above with no traces of tar
	1 6 10 14	SS	100%	wet	13ppm 6ppm		Same as above (sample from top)
15	5 9 8 14	SS	100%	wet	20ppm		Same as above (picture-9)
							E.O.B. 16'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-27-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: RWW & JHS(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-32
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 101.1

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	1 2 1 2	SS	NA	dry	NA		Black clinker, black gravelly sand
	5 4 3 2	SS	NA	dry	6ppm at 4.0		Gray sand, thin layer of tar (1"thick) at 4.0
5	1 1 0 1	SS	40%	wet	0.5 ppm		Gray sand at 6.0 , 1" black silt with stron tar odor (this is dry)- tar mixed in with silt
	3 2 5 7	SS	80%	wet	0.5 ppm		6.0-6.5 Dark gray sand 6.5-6.8 Tan silty clay with gravel 8.9-10.0 Dark gray, well sorted sand 7.0-8.0 Dark gray sand with mild tar odor
10	4 8 6 2	SS	90%	wet	2ppm		8.0-8.3 Dark gray sand 8.3-8.9 Dark gray gravelly sand 8.9-10.0 Dark gray, well sorted sand (Note the dark gray appears to be a natual coloration)
	5 4 8 9	SS	60%	wet	2ppm		10.0-10.5 Dark gray sand 10.5-10.8 Dark gray gravelly sand 10.8-11.3 Dark gray sand No discernible odor
	5 5 13 15	SS	90%	wet	<1ppm		Dark gray sand (same as above)with a very faint tar odor
15	7 9 13 24	SS	100%	wet	<1ppm		Same as above, becoming lighter @ 15.5 Washing out auger
	12 14 17 21	SS	60%	wet	<1ppm		Gray sand (same as above) with a very faint hydrocarbon odor
20	13 12 17 21	SS	100%	wet	<1ppm		(6" of blow in) Same as above (no odor to faint odor)
	12 16 13 22	SS	100%	wet	<1ppm		Same as above, very faint odor
	18 13 12 19	SS	100%	wet	<1ppm		Same as above, very faint odor
25	24 25 29 33	SS	100%	wet	0ppm		Same as above, clay in the toe-clay @ 1.6" clay is actually a clayey silt- hard pan.
30							E.O.B. 26'

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-29-91
DATE COMPLETED: 3-29-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-33
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 104.0

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	1 1 3 4	SS	100%	dry	0ppm		Topsoil-brown sandy clay
	2 3 4 3	SS	75%	wet	0ppm		3.5 Topsoil-brown sandy clay 3.5-4.0 Clinker mixed in sand
5	1 2 1 1	SS	50%	wet	0ppm		5.0-5.3 Brown clayey silt to silty clay 5.3-6.0 Clinker mixed in sand
	7 5 4 4	SS	50%	wet	8ppm		7.0-7.4 Clinker? (possibly same as 5.3-6.0) 7.4-8.0 Sand and gravel with tar in interstices (sample)
10	4 4 4 5	SS	100%	wet	0.5 ppm		8.0-8.5 Brown clayey silt 8.5-8.7 Black gravel with sand 8.7-10.0 Gray sand
	4 5 8 11	SS	100%	wet	0ppm		Gray to light bown sand
	7 6 8 10	SS	100%	wet	0ppm		Same as above
15	13 10 13 15	SS	100%	wet	0ppm		Same as above (picture-10)
20							E.O.B. 16'
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-34
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 100.4

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	0 1 1 1	SS	0%	dry	0ppm		White gypsum material in toe
	0 3 4 2	SS	75%	wet	0ppm		2.0-3.0 Gypsum-broken buff to white sypsum board material 3.0 Black gravel with sand 4.0 Clinker mixed in sand
5	2 2 1 3	SS	75%	wet	0ppm		4.5-5.0 Gypsum board material 5.0-6.0 Black gravel (clinker)oily film on gravel
	0 2 2 3	SS	50%	wet	20ppm (0ppm in hole)		Sand with tar at 8.0' (sample) may have trace of peat-like material
10	3 3 5 6	SS	75%	wet	10ppm		8.5 piece of tar, oily film (sample) 8.5-9.0 Gypsum fill 9.0-10.0 Black sand with tar
	2 4 5 7	SS	100%	wet	6ppm		Gray sand 11.6-11.8 Brown clay some odor-tar-like
	10 6 12 17	SS	100%	wet	0ppm		Gray sand with oily film, no odor (sample)
15	10 12 11 15	SS	100%	wet	0ppm		Same as above
20							E.O.B. 16'
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-29-91
DATE COMPLETED: 3-29-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-35A (2' north of B-35)
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 102.8

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0			no samp.				No samples
5	3 3 2 3	SS	50%	wet	0ppm		5.0-5.3 Gypsum board-material-white to buff 5.3-6.0 Clinker (sample) - gravel & sand matrix
							E.O.B. 6'
10							
15							
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

Note: Boring B-35A performed to recover sample form 4-6'.

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-29-91
DATE COMPLETED: 3-29-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-35
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 102.7

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0	0 0 1 1	SS	80%	dry	0ppm		Gypsum board- material - white to buff
	4 6 4 3	SS	75%	wet	0ppm		2.5 No recovery 2.5-3.0 Gypsum board material 3.7 Black clinker, gravel, sand 3.7-4.0 Black sand no odor
5	3 2 1 1	SS	0%	wet			No sample recovered
	2 1 3 3	SS	50%	wet	0ppm		6.8-7.0 Gypsum and debris 7.0-8.0 Black sand (sample) slight odor
	2 3 6 11	SS	75%	wet	10ppm		Gray sand
10	6 8 11 12	SS	100%	wet	6ppm		Same as above (sample)
15							E.O.B. 12'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

Note: Boring B-35A was performed next to B-35 to recovery upper 6' of soil.

BORING LOG

PROJECT: Waukegan Tar Pit Site
DATE STARTED: 3-28-91
DATE COMPLETED: 3-28-91
FIELD INSPECTOR: James Staberg(BEC)
CREW CHIEF: Exploration Technology

BORING NO.: B-36
RISER PIPE ELEVATION: N/A
GROUND SURFACE ELEVATION: 100.4

Depth (Feet)	Blows Per 6"	Sample Type	Percent Recovery	Water Content	Net HNU	Profile	DESCRIPTION OF MATERIALS AND REMARKS
0							
	0 0 1 2	SS	50%	dry	5ppm		1.0-1.5 Gypsum and tar- gypsum material is white to buff 1.5-2.0 Tar (sample)
	0 0 1 3	SS	75%	wet	40 ppm		2.0-3.0 Gypsum material 3.0 Tar 3.5-4.0 Black sand-tar mix
5	0 2 4 5	SS	75%	wet	5ppm 25 ppm (tar)		4.5 Tar(sample)- Head space HNU sample in Jan. = 25ppm 5.0-6.0 Black sand
	0 3 5 7	SS	60%	wet	7ppm		6.0-6.5 Tar and sand with oily film (sample) 6.5-7.5 Black sand
	3 5 6 7	SS	100%	wet	10ppm		8.0-9.0 Sand 9.0 Tar and sand 9.3-10.0 Black sandy gravel
10	4 4 8 13	SS	90%	wet	5ppm		10.0-10.9 Black sand 10.9-11.2 Tar and sand (sample) 11.2-12.0 Black sand
	5 7 7 12	SS	90%	wet	5ppm (sand) 3ppm (gravel)		12.0-13.0 Gray sand 13.0-13.5 Sandy gravel 13.5-14.0 Gray sand
15	6 10 13 12	SS	100%	wet	3ppm		14.0-15.2 Gray sand 15.2-16.0 Gravel with sand
							E.O.B. 16'
20							
25							
30							

COMMENT: Ground Surface Elevation Referenced to North East Manhole (Assigned Elevation of 100 Ft.).

CS: Continuous Sample
SS: Split Spoon Sample

APPENDIX B
LABORATORY ANALYSES REPORTS

APPENDIX B-1
COMPOSITE TAR SAMPLE
LABORATORY ANALYSES REPORT

Engineers
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April 9, 1991

APR 1

LMG27317.XY

Ms. Mary Mackey
Barr Engineering Company
Four Paramount Plaza
7803 Glenroy Road, Suite 100
Minneapolis, Minnesota 55439-3123

RE: Analytical Data for LMG Laboratory No. 18024

Dear Ms. Mackey:

On March 12, 1991, the CH2M Hill Montgomery Laboratory received one sample with a request for analysis of selected organic and inorganic parameters.

The analytical results and associated quality control data are enclosed. The Volatile analysis was performed at our Redding, California laboratory. A copy of their report is enclosed.

If you should have any questions concerning the data, please inquire.

The CH2M HILL policy is to store samples for up to 30 days after reporting. If you desire, our laboratory will maintain your samples for a longer period at a cost of $5.00 per sample per month. Samples determined to be hazardous can either be returned to you or disposed of at a cost of $25.00 per sample.

Sincerely,

for Wanda L. Hall
Data Package Supervisor

Enclosures

cc: Dr. Larry Dalen

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TABLE OF CONTENTS

CH2M HILL/LMG Laboratory No. 18024

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ANALYTICAL METHODOLOGY

Organic Analysis

Priority Pollutants: Water, soil and waste samples are analyzed in accordance with procedures described in Methods 608, 624, and 625, EPA-600/4-82-057 (1982); Methods 8080, 8240, and 8270, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition; and methods outlined in the USEPA Contract Laboratory Program Statement of Work for Organics Analysis, February, 1988.

Volatile Analysis (Safe Drinking Water Act): Water samples are analyzed in accordance with procedures described in Method 524.2, Federal Register (50 FR 46902), November 13, 1985.

Chlorinated Phenoxyacid Herbicides: Samples are analyzed with procedures described in Method 8150, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Organophosphate Pesticides: Samples are analyzed in accordance with procedures described in Methods 614 and 622, EPA-600/4-79-019 (1979) and in Method 8140, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Phenol Analysis by GC: Samples are analyzed in accordance with procedures outlined in Method 604, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8040, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Polynuclear Aromatic Hydrocarbons (GC analysis): Samples are analyzed with procedures described in Method 610, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8100, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Ethylene Dibromide : Water samples are analyzed in accordance with procedures outlined in Method 504, Federal Register (50 FR 46902), November 13, 1985.

Trihalomethanes: Water samples are analyzed with procedures described in Method 501.2, Federal Register, Vol. 44, No. 231, Part II, November 29, 1979.

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548 Montgomery, Alabama 36116 205 271 1444

EPA - DEFINED QUALIFIERS

ORGANICS

Definitions for the EPA-defined qualifiers:

U -- Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the quantitation limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.

J -- Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound below the stated quantitation limit. The "J" qualifier is not used with pesticide results.

C -- This flag applies to pesticide results only. The "C" flag indicates the presence of this compound has been confirmed by GC/MS analysis.

B -- This flag is used when the analyte is found in the associated blank as well as the sample. This notation indicates possible blank contamination and suggests the data user evaluate these compounds and their amounts carefully.

E -- This flag applies to GC/MS only. The "E" qualifier indicates a compound may be above or below the linear range of the instrument. If the particular compound level is deemed above the linear calibration range, then the sample should be reanalyzed at an appropriate dilution. Therefore, the "E" qualified amount is an estimated concentration. The results for the dilution will be reported on a separate Form I and will be flagged with a "D" if the dilution brings the concentration within proper calibration.

D -- This flag identifies compounds which have been run at a dilution to bring the concentration of that compound within the linear range of the instrument. "D" qualifiers are only used for samples that have been run initially with results above acceptable ranges. For secondary dilutions the "DL" suffix is appended to the sample number on the Form I.

A -- Indicates the Tentatively Identified Compound (TIC) is a suspected aldol-condensation product.

X -- Indicates the compound concentration has been manually modified or the EPA qualifier has been manually modified or added.

JX -- The compound was detected and quantitated below the Contract Required Quantitation Limit.

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548 Montgomery, Alabama 36116 205 271 1444

CLIENT SAMPLE ID QUALIFIERS

LEVEL 1

The qualifiers that GC/MS uses with the client sample ID are defined below:

DL -- Dilution Run

R -- Rerun (may be followed by a digit to indicate multiple reruns)

RD -- Diluted Rerun

RX -- Re-extraction Analysis

MS -- Matrix Spike (may be followed by a digit to indicate multiple matrix spikes within a sample set)

MSD -- Matrix Spike Duplicate (may be followed by a digit to indicate multiple matrix spike duplicates within a sample set)

QC_BLANK -- Method Blank (may be followed by an **S** for soils run at a low level, **W** for waters, or **SM** for soils run at a medium level) (letters may be followed by a digit to indicate multiple blanks of that type; if there are no letters the digit indicates multiple blanks).

These qualifiers allow GC/MS to have unique client sample ID's so that the client can get more accurate information from the data reported.

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548, Montgomery, Alabama 36116 205 271 1444

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TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 18024

CH2M HILL Sample No.	Sample Description				
18024001	WAUKEGA	02/27/91	1100	13/49-004JSL01	PO#02738

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548, Montgomery, Alabama 36116 205 271 1444

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REPORT OF ANALYTICAL RESULTS

Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: WAUKEGA TAR 1100 COMP
Laboratory Sample Number: 18024001 Date Collected: 02/27/91 Matrix: TAR

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
1,1,1-Trichloroethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,1,2,2-Tetrachloroethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,1,2-Trichloroethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,1-Dichloroethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,1-Dichloroethene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,2-Dichlorobenzene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,2-Dichloroethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,2-Dichloropropane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,3-Dichlorobenzene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
1,4-Dichlorobenzene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Benzene	SW8010/8020(MOD)	50000	140000	ug/Kg	03/26/91
Bromodichloromethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Bromoform	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Bromomethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Carbon tetrachloride	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Chlorobenzene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Chloroethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Chloroform	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Chloromethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Dibromochloromethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Dichloromethane (Methylene chloride)	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Ethylbenzene	SW8010/8020(MOD)	50000	100000	ug/Kg	03/26/91
Tetrachloroethene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Toluene	SW8010/8020(MOD)	50000	220000	ug/Kg	03/26/91
Trichloroethene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Trichlorofluoromethane	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Vinyl chloride	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Xylenes (Total)	SW8010/8020(MOD)	50000	420000	ug/Kg	03/26/91
cis-1,3-Dichloropropene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
tert-Butyl methyl ether	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
trans-1,2-Dichloroethene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
trans-1,3-Dichloropropene	SW8010/8020(MOD)	50000	U	ug/Kg	03/26/91
Bromochloromethane - SS	SW8010/8020(MOD)	----	NR	%rec	03/26/91
Fluorobenzene - SS	SW8010/8020(MOD)	----	114	%rec	03/26/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: U = Compound analyzed for but not detected. NR = Not reported.

Reviewed by: _____

INRPRPT(v910124)
000001

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REPORT OF ANALYTICAL RESULTS Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: WAUKEGA TAR 1100 COMP
Laboratory Sample Number: 18024001 Date Collected: 02/27/91 Matrix: TAR

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
a,a,a-Trifluorotoluene - SS	SW8010/8020(MOD)	----	NR	%rec	03/26/91
1,4-Dichlorobutane - SS	SW8010/8020(MOD)	----	105	%rec	03/26/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: U = Compound analyzed for but not detected. NR = Not reported.

Reviewed by: _____

INRPRPT(v910124)

000002

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REPORT OF ANALYTICAL RESULTS

Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 18024ZS1 Date Collected: 03/12/91 Matrix: TAR BLANK

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
1,1,1-Trichloroethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,1,2,2-Tetrachloroethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,1,2-Trichloroethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,1-Dichloroethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,1-Dichloroethene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,2-Dichlorobenzene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,2-Dichloroethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,2-Dichloropropane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,3-Dichlorobenzene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
1,4-Dichlorobenzene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Benzene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Bromodichloromethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Bromoform	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Bromomethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Carbon tetrachloride	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Chlorobenzene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Chloroethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Chloroform	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Chloromethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Dibromochloromethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Dichloromethane (Methylene chloride)	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Ethylbenzene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Tetrachloroethene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Toluene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Trichloroethene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Trichlorofluoromethane	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Vinyl chloride	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Xylenes (Total)	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
cis-1,3-Dichloropropene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
tert-Butyl methyl ether	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
trans-1,2-Dichloroethene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
trans-1,3-Dichloropropene	SW8010/8020(MOD)	1.0	U	ug/Kg	03/26/91
Bromochloromethane - SS	SW8010/8020(MOD)	----	NR	%rec	03/26/91
Fluorobenzene - SS	SW8010/8020(MOD)	----	122	%rec	03/26/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: U = Compound analyzed for but not detected. NR = Not reported.

Reviewed by: _____

INRPRPT(v910124)
000003

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REPORT OF ANALYTICAL RESULTS Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 18024ZS1 Date Collected: 03/12/91 Matrix: TAR BLANK

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
a,a,a-Trifluorotoluene - SS	SW8010/8020(MOD)	----	NR	%rec	03/26/91
1,4-Dichlorobutane - SS	SW8010/8020(MOD)	----	112	%rec	03/26/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: U = Compound analyzed for but not detected. NR = Not reported.

Reviewed by: _____

INRPRPT(v910124)

000004

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REPORT OF ANALYTICAL RESULTS

Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 18024ZS2 Date Collected: 03/12/91 Matrix: TAR BLANK

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
1,1,1-Trichloroethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,1,2,2-Tetrachloroethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,1,2-Trichloroethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,1-Dichloroethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,1-Dichloroethene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,2-Dichlorobenzene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,2-Dichloroethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,2-Dichloropropane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,3-Dichlorobenzene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
1,4-Dichlorobenzene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Benzene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Bromodichloromethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Bromoform	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Bromomethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Carbon tetrachloride	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Chlorobenzene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Chloroethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Chloroform	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Chloromethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Dibromochloromethane	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Dichloromethane (Methylene chloride)	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Ethylbenzene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Tetrachloroethene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Toluene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Trichloroethene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Trichlorofluoromethane	SW8010/8020(MOD)	50	600	ug/Kg	03/26/91
Vinyl chloride	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Xylenes (Total)	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
cis-1,3-Dichloropropene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
tert-Butyl methyl ether	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
trans-1,2-Dichloroethene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
trans-1,3-Dichloropropene	SW8010/8020(MOD)	50	U	ug/Kg	03/26/91
Bromochloromethane - SS	SW8010/8020(MOD)	----	NR	%rec	03/26/91
Fluorobenzene - SS	SW8010/8020(MOD)	----	119	%rec	03/26/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: U = Compound analyzed for but not detected. NR = Not reported.

Reviewed by: _____

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000005

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REPORT OF ANALYTICAL RESULTS

Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 18024ZS2 Date Collected: 03/12/91 Matrix: TAR BLANK

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
a,a,a-Trifluorotoluene - SS	SW8010/8020(MOD)	----	NR	%rec	03/26/91
1,4-Dichlorobutane - SS	SW8010/8020(MOD)	----	108	%rec	03/26/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: U = Compound analyzed for but not detected. NR = Not reported.

Reviewed by: _____

INRPRPT(v910124)

000006

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CASE NARRATIVE FOR SEMIVOLATILE MASS SPECTROMETRY SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: BARR

CASE NO. : N/A CONTRACT NO.: N/A

LAB NO. : 18024 SDG NO.: N/A

I. RECEIPT

A. DATE : March 12, 1991

B. SAMPLE INFORMATION

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
18024001	WAUKEGA_TAR	TAR	02/27/91	03/13/91	03/18/91
T03131B1	QC_BLANK_S	TAR	NA	03/13/91	03/18/91

C. Documentation

Exceptions : No exceptions were encountered.

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II. EXTRACTION

A. Holding Times: All holding times were met.

B. Extraction Exceptions : No exceptions were encountered.

III. ANALYSIS

A. Holding Times: All holding times were met.

B. Analytical Exceptions : No exceptions were encountered.

IV. QUALITY CONTROL

A. Method Blank : All associated method blanks met acceptable QC criteria.

B. Surrogate Recoveries : Surrogate recoveries could not be determined for sample 18024001 due to the dilution required for analysis. All other samples met acceptable QC limits.

C. Matrix Spike Results : Matrix spike results have not been reported with this contract.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Herb Kelly — Date 4/10/91
Manager, Organic Division

CH2M HILL Quality Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548 Montgomery, Alabama 36116
205 271 1444

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM
Lab Sample ID: 18024001
Client Sample ID: WAUKEGA TAR

Concentration: LOW
Sample Matrix: TAR
Percent Moisture:

Date Extracted: 03/13/91
Date Analyzed: 03/18/91
Dilution Factor: 8700

SEMIVOLATILE COMPOUNDS

CAS Number		ug/Kg	CAS Number		ug/Kg
62-75-9	N-Nitrosodimethylamine	2.9E6 U	100-02-7	4-Nitrophenol	1.4E7 U
108-95-2	Phenol	2.9E6 U	132-64-9	Dibenzofuran	700000J
62-53-3	Aniline	2.9E6 U	121-14-2	2,4-Dinitrotoluene	2.9E6 U
111-44-4	bis(2-Chloroethyl)Ether	2.9E6 U	84-66-2	Diethylphthalate	2.9E6 U
95-57-8	2-Chlorophenol	2.9E6 U	7005-72-3	4-Chlorophenyl-phenylether	2.9E6 U
541-73-1	1,3-Dichlorobenzene	2.9E6 U	86-73-7	Fluorene	5.6E6
106-46-7	1,4-Dichlorobenzene	2.9E6 U	100-01-6	4-Nitroaniline	1.4E7 U
100-51-6	Benzyl Alcohol	2.9E6 U	534-52-1	4,6-Dinitro-2-methylphenol	1.4E7 U
95-50-1	1,2-Dichlorobenzene	2.9E6 U	86-30-6	N-Nitrosodiphenylamine (1)	2.9E6 U
95-48-7	2-Methylphenol	2.9E6 U	122-66-7	1,2-Diphenylhydrazine	2.9E6 U
108-60-1	bis(2-Chloroisopropyl)Ether	2.9E6 U	101-55-3	4-Bromophenyl-phenylether	2.9E6 U
106-44-5	4-Methylphenol	2.9E6 U	118-74-1	Hexachlorobenzene	2.9E6 U
621-64-7	N-Nitroso-di-n-propylamine	2.9E6 U	87-86-5	Pentachlorophenol	1.4E7 U
67-72-1	Hexachloroethane	2.9E6 U	85-01-8	Phenanthrene	1.6E7
98-95-3	Nitrobenzene	2.9E6 U	120-12-7	Anthracene	4.3E6
78-59-1	Isophorone	2.9E6 U	84-74-2	Di-n-Butylphthalate	2.9E6 U
88-75-5	2-Nitrophenol	2.9E6 U	206-44-0	Fluoranthene	5.3E6
105-67-9	2,4-Dimethylphenol	2.9E6 U	92-87-5	Benzidine	1.4E7 U
65-85-0	Benzoic acid	1.4E7 U	129-00-0	Pyrene	8.5E6
111-91-1	bis(2-Chloroethoxy)Methane	2.9E6 U	85-68-7	Butylbenzylphthalate	2.9E6 U
120-83-2	2,4-Dichlorophenol	2.9E6 U	91-94-1	3,3'-Dichlorobenzidine	5.8E6 U
120-82-1	1,2,4-Trichlorobenzene	2.9E6 U	56-55-3	Benzo(a)anthracene	3.8E6
91-20-3	Naphthalene	2.7E7	218-01-9	Chrysene	4.3E6
106-47-8	4-Chloroaniline	2.9E6 U	117-81-7	bis(2-Ethylhexyl)phthalate	2.9E6 U
87-68-3	Hexachlorobutadiene	2.9E6 U	117-84-0	Di-n-octylphthalate	2.9E6 U
59-50-7	4-Chloro-3-methylphenol	2.9E6 U	205-99-2	Benzo(b)fluoranthene	1.3E6 J
91-57-6	2-Methylnaphthalene	1.4E7	207-08-9	Benzo(k)fluoranthene	1.7E6 J
77-47-4	Hexachlorocyclopentadiene	2.9E6 U	50-32-8	Benzo(a)pyrene	2.9E6
88-06-2	2,4,6-Trichlorophenol	2.9E6 U	193-39-5	Indeno(1,2,3-cd)pyrene	1.1E6 J
95-95-4	2,4,5-Trichlorophenol	1.4E7 U	53-70-3	Dibenz(a,h)anthracene	2.9E6 U
91-58-7	2-Chloronaphthalene	2.9E6 U	191-24-2	Benzo(g,h,i)perylene	1.2E6 J
88-74-4	2-Nitroaniline	1.4E7 U			
131-11-3	Dimethyl Phthalate	2.9E6 U		Nitrobenzene-d5 - SS	**
208-96-8	Acenaphthylene	8.4E6		2-Fluorobiphenyl - SS	**
606-20-2	2,6-Dinitrotoluene	2.9E6 U		Terphenyl-d14 - SS	**
99-09-2	3-Nitroaniline	1.4E7 U		Phenol-d5 - SS	**
83-32-9	Acenaphthene	1.0E6 J		2-Fluorophenol - SS	**
51-28-5	2,4-Dinitrophenol	1.4E7 U		2,4,6-Tribromophenol - SS	**

(1) - Cannot be separated from diphenylamine.
U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.
** - Surrogate Standard not determined due to required dilution.

Form I

000009

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Laboratory Name: CH2M HILL/MGM
Case No: S18024

Sample Number
WAUKEGA_TAR

TENTATIVELY IDENTIFIED COMPOUNDS
(Page 4)

	CAS Number	Compound Name	Fraction	Scan Num	Estimated Conc ug/Kg	
1		BENZENE, -ETHENYL -METHYL- ISOMER	BNA		2600000	J
2		BENZENE, -ETHYNYL -METHYL- ISOMER	BNA		7100000	J
3	90-12-0	NAPHTHALENE, 1-METHYL-	BNA		10000000	J
4	571-61-9	NAPHTHALENE, 1,5-DIMETHYL-	BNA		2400000	J
5	573-98-8	NAPHTHALENE, 1,2-DIMETHYL-	BNA		3600000	J
6	827-54-3	NAPHTHALENE, 2-ETHENYL-	BNA		2900000	J
7	613-12-7	ANTHRACENE, 2-METHYL-	BNA		2800000	J
8	610-48-0	ANTHRACENE, 1-METHYL-	BNA		2900000	J
9	832-64-4	PHENANTHRENE, 4-METHYL-	BNA		4900000	J
10	2381-21-7	PYRENE, 1-METHYL-	BNA		2400000	J

No volatile compounds found.

J - Estimated compound concentration using RF=1.

See page 1A for complete definitions of the data reporting qualifiers.

According to EPA protocols only the ten largest TICs from each fraction are reported. This does not imply that additional TICs are not present.

Form I

000010

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	03/13/91
Lab Sample ID:	T03131B1	Sample Matrix:	TAR	Date Analyzed:	03/18/91
Client Sample ID:	QC BLANK S	Percent Moisture:		Dilution Factor:	1.0

SEMIVOLATILE COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
62-75-9	N-Nitrosodimethylamine	330	U	100-02-7	4-Nitrophenol	1600	U
108-95-2	Phenol	330	U	132-64-9	Dibenzofuran	330	U
62-53-3	Aniline	330	U	121-14-2	2,4-Dinitrotoluene	330	U
111-44-4	bis(2-Chloroethyl)Ether	330	U	84-66-2	Diethylphthalate	330	U
95-57-8	2-Chlorophenol	330	U	7005-72-3	4-Chlorophenyl-phenylether	330	U
541-73-1	1,3-Dichlorobenzene	330	U	86-73-7	Fluorene	330	U
106-46-7	1,4-Dichlorobenzene	330	U	100-01-6	4-Nitroaniline	1600	U
100-51-6	Benzyl Alcohol	330	U	534-52-1	4,6-Dinitro-2-methylphenol	1600	U
95-50-1	1,2-Dichlorobenzene	330	U	86-30-6	N-Nitrosodiphenylamine (1)	330	U
95-48-7	2-Methylphenol	330	U	122-66-7	1,2-Diphenylhydrazine	330	U
108-60-1	bis(2-Chloroisopropyl)Ether	330	U	101-55-3	4-Bromophenyl-phenylether	330	U
106-44-5	4-Methylphenol	330	U	118-74-1	Hexachlorobenzene	330	U
621-64-7	N-Nitroso-di-n-propylamine	330	U	87-86-5	Pentachlorophenol	330	U
67-72-1	Hexachloroethane	330	U	85-01-8	Phenanthrene	330	U
98-95-3	Nitrobenzene	330	U	120-12-7	Anthracene	330	U
78-59-1	Isophorone	330	U	84-74-2	Di-n-Butylphthalate	330	U
88-75-5	2-Nitrophenol	330	U	206-44-0	Fluoranthene	330	U
105-67-9	2,4-Dimethylphenol	330	U	92-87-5	Benzidine	1600	U
65-85-0	Benzoic acid	1600	U	129-00-0	Pyrene	330	U
111-91-1	bis(2-Chloroethoxy)Methane	330	U	85-68-7	Butylbenzylphthalate	330	U
120-83-2	2,4-Dichlorophenol	330	U	91-94-1	3,3'-Dichlorobenzidine	660	U
120-82-1	1,2,4-Trichlorobenzene	330	U	56-55-3	Benzo(a)anthracene	330	U
91-20-3	Naphthalene	330	U	218-01-9	Chrysene	330	U
106-47-8	4-Chloroaniline	330	U	117-81-7	bis(2-Ethylhexyl)phthalate	330	U
87-68-3	Hexachlorobutadiene	330	U	117-84-0	Di-n-octylphthalate	330	U
59-50-7	4-Chloro-3-methylphenol	330	U	205-99-2	Benzo(b)fluoranthene	330	U
91-57-6	2-Methylnaphthalene	330	U	207-08-9	Benzo(k)fluoranthene	330	U
77-47-4	Hexachlorocyclopentadiene	330	U	50-32-8	Benzo(a)pyrene	330	U
88-06-2	2,4,6-Trichlorophenol	330	U	193-39-5	Indeno(1,2,3-cd)pyrene	330	U
95-95-4	2,4,5-Trichlorophenol	330	U	53-70-3	Dibenz(a,h)anthracene	330	U
91-58-7	2-Chloronaphthalene	330	U	191-24-2	Benzo(g,h,i)perylene	330	U
88-74-4	2-Nitroaniline	1600	U				
131-11-3	Dimethyl Phthalate	330	U		Nitrobenzene-d5 - SS	96	
208-96-8	Acenaphthylene	330	U		2-Fluorobiphenyl - SS	101	
606-20-2	2,6-Dinitrotoluene	330	U		Terphenyl-d14 - SS	101	
99-09-2	3-Nitroaniline	1600	U		Phenol-d5 - SS	82	
83-32-9	Acenaphthene	330	U		2-Fluorophenol - SS	71	
51-28-5	2,4-Dinitrophenol	1600	U		2,4,6-Tribromophenol - SS	86	

(1) - Cannot be separated from diphenylamine.
U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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Laboratory Name: CH2M HILL/MGM
Case No: S18024

Sample Number
QC_BLANK_S

TENTATIVELY IDENTIFIED COMPOUNDS
(Page 4)

CAS Number	Compound Name	Fraction	Scan Num	Estimated Conc ug/Kg

No volatile compounds found.
No semi-volatile compounds found.

J - Estimated compound concentration using RF=1.
See page 1A for complete definitions of the data reporting qualifiers.
According to EPA protocols only the ten largest TICs from each fraction are reported. This does not imply that additional TICs are not present.

Form I

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CASE NARRATIVE FOR PNA
GAS CHROMATOGRAPHY SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: BARR

CASE NO. : N/A CONTRACT NO.: N/A

LAB NO. : 18024 SDG NO.: N/A

I. RECEIPT

A. DATE : March 12, 1991

B. SAMPLE INFORMATION

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
18024001	WAUKEGA TAR	TAR	02/27/91	03/13/91	03/19/91
T03013B1	QC BLANK	TAR	NA	03/13/91	03/18/91

C. Documentation
Exceptions : No exceptions were encountered.

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive P O Box 230548 Montgomery, Alabama 36116 205 271 1444

II. EXTRACTION

A. Holding Times: All holding times were met.

B. Extraction Exceptions : Only 0.125g of sample for sample #18024001 was prepared for analysis.

III. ANALYSIS

A. Holding Times: All holding times were met.

B. Analytical Exceptions : No exceptions were encountered.

IV. QUALITY CONTROL

A. Method Blank : All associated method blanks met acceptable QC criteria.

B. Surrogate Recoveries : All samples met acceptable QC limits.

C. Matrix Spike Results : Matrix spike results have not been reported with this contract.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Herb Kelly — Date 4/10/91

Herb Kelly
Manager, Organic Division

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	03/13/91
Lab Sample ID:	18024001	Sample Matrix:	TAR	Date Analyzed:	03/19/91
Client Sample ID:	WAUKEGA TAR	Percent Moisture:		Dilution Factor:	50

PNA COMPOUNDS

CAS Number		ug/ g		CAS Number		ug/ g
91-20-3	Naphthalene	18000				
91-57-6	2-Methylnaphthalene	6000				
90-12-0	1-Methylnaphthalene	4200				
208-96-8	Acenaphthylene	4200				
83-32-9	Acenaphthene	340	JX			
86-73-7	Fluorene	2700				
85-01-8	Phenanthrene	7000				
120-12-7	Anthracene	1400				
206-44-0	Fluoranthene	2100				
129-00-0	Pyrene	4300				
56-55-3	Benzo(a)anthracene	1200				
218-01-9	Chrysene	1300				
205-99-2	Benzo(b)fluoranthene	510				
207-08-9	Benzo(k)fluoranthene	930				
50-32-8	Benzo(a)pyrene	1100				
193-39-5	Indeno(1,2,3-cd)pyrene	330	JX			
53-70-3	Dibenzo(a,h)anthracene	400	U			
191-24-2	Benzo(g,h,i)perylene	630				
	Terphenyl-d14 SS	--				

U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Comments: Surrogate not determined due to dilution factor.

Form I

000015

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	03/13/91
Lab Sample ID:	T03013B1	Sample Matrix:	TAR	Date Analyzed:	03/18/91
Client Sample ID:	QC BLANK	Percent Moisture:		Dilution Factor:	1.0

PNA COMPOUNDS

CAS Number		ug/Kg		CAS Number	ug/Kg
91-20-3	Naphthalene	50	U		
91-57-6	2-Methylnaphthalene . . .	50	U		
90-12-0	1-Methylnaphthalene . . .	50	U		
208-96-8	Acenaphthylene	50	U		
83-32-9	Acenaphthene	50	U		
86-73-7	Fluorene.	50	U		
85-01-8	Phenanthrene.	50	U		
120-12-7	Anthracene.	50	U		
206-44-0	Fluoranthene.	50	U		
129-00-0	Pyrene.	50	U		
56-55-3	Benzo(a)anthracene. . . .	50	U		
218-01-9	Chrysene.	50	U		
205-99-2	Benzo(b)fluoranthene . .	50	U		
207-08-9	Benzo(k)fluoranthene . .	50	U		
50-32-8	Benzo(a)pyrene.	50	U		
193-39-5	Indeno(1,2,3-cd)pyrene. .	50	U		
53-70-3	Dibenzo(a,h)anthracene. .	50	U		
191-24-2	Benzo(g,h,i)perylene. . .	50	U		
	Terphenyl-d14 SS	104			

U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Comments:

Form I

000016

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CASE NARRATIVE
General Chemistry

Batch Number: 18024

Client/Project: BARR ENGINEERING COMPANY

I. **Holding Time:** All criteria met.

II. **Analysis:**

A.	Calibration:	Acceptance criteria met.
B.	Blanks:	Acceptance criteria met.
C.	Matrix Spike:	Acceptance criteria met.
D.	Duplicate Analysis:	Acceptance criteria met.
E.	Lab Control Sample:	Acceptance criteria met.
F.	Other:	Sample #18024001 did burn during the ignitability test but not so vigorously and persistently that it creates a hazard.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ **DATE:** 9APR91

Kevin A. Sanders
Inorganic Division Manager

000017

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REPORT OF ANALYTICAL RESULTS Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: WAUKEGA TAR 1100 COMP
Laboratory Sample Number: 18024001 Date Collected: 02/27/91 Matrix: TAR

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Ignitability	SW846(1C):7.1	----	Non-ignitable *	----	04/03/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: * = See cover letter.
COMMENT: NA = Not applicable.

Reviewed by: _____

INRPRPT(v910124)

000018

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REPORT OF ANALYTICAL RESULTS

Date: 04/04/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO.02738
Laboratory Number: 18024
Date Received: 03/12/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 18024ZS1 Date Collected: 03/12/91 Matrix: TAR BLANK

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Ignitability	SW846(1C):7.1	----	NA	----	04/03/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: * = See cover letter.
COMMENT: NA = Not applicable.

Reviewed by: _____

INRPRPT(v910124)

000019

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CASE NARRATIVE FOR VOLATILE GAS CHROMATOGRAPHY SAMPLES

LABORATORY: CH2M HILL
CLIENT : Barr Engineering
CASE NO : N/A
CONTRACT NO.: N/A
LAB ID : 29088
SDG # : N/A

I. RECEIPT

A. Date: March 14, 1991

B.

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
29088001	Waukega Tar	Tar	02/27/91	03/18/91	03/26/91

C. Documentation Exceptions : None encountered.

II. EXTRACTION

A. Holding Times: Holding time all met.

B. Extraction Exceptions : Not applicable.

III. ANALYSIS

A. Holding Times: Holding time all met.

B. Analytical Exceptions : None encountered.

CH2M HILL Redding Quality Analytical Laboratories 5090 Caterpillar Road, Redding, California 96003 916 244 5227

IV. QUALITY CONTROL

A. Method Blank : Trichlorofluormethane was detected in the methanol blank associated with the sample in this contract.

B. Surrogate Recoveries : All met acceptable QC criteria.

C. Matrix Spike Results: Not applicable.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature. Diskette deliverables have not been provided for this data package.

Warren Kirkland 4/19

for **Greg Jordan** **Date**
GC Section Supervisor

kdh.H

000021

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client:	Barr Engineering	Laboratory:	CH2M Hill/LRD	Date Sampled:	02/27/91
Project:	N/A	Lab Sample ID:	29088-1	Date Received:	03/14/91
Proj No:	13/49-004JSL01	% Moisture:	100.0	Date Extracted:	03/18/91
Method:	EPA 8010/8020	Dilution Factor:	1000	Date Analyzed:	03/26/91
Matrix:	Tar	Instrument ID:	3600	Analyst:	C.D.
Sampler:	Cleint			Date Reported:	04/01/91

Client Sample ID/Description: Waukega Tar

CAS Number	Compound	Reporting Limit	Sample Result	Confirmation Result	Reporting Units
74-87-3	Chloromethane	50,000	U	NR	ug/kg
74-83-9	Bromomethane	50,000	U	NR	ug/kg
75-01-4	Vinyl chloride	50,000	U	NR	ug/kg
75-00-3	Chloroethane	50,000	U	NR	ug/kg
75-09-2	Dichloromethane	50,000	U	NR	ug/kg
75-69-4	Trichlorofluoromethane	50,000	U	NR	ug/kg
75-35-4	1,1-Dichloroethene	50,000	U	NR	ug/kg
75-34-3	1,1-Dichloroethane	50,000	U	NR	ug/kg
156-60-5	trans-1,2-Dichloroethene	50,000	U	NR	ug/kg
67-66-3	Chloroform	50,000	U	NR	ug/kg
107-06-2	1,2-Dichloroethane	50,000	U	NR	ug/kg
71-55-6	1,1,1-Trichloroethane	50,000	U	NR	ug/kg
56-23-5	Carbon tetrachloride	50,000	U	NR	ug/kg
75-27-4	Bromodichloromethane	50,000	U	NR	ug/kg
78-87-5	1,2-Dichloropropane	50,000	U	NR	ug/kg
10061-01-5	cis-1,3-Dichloropropene	50,000	U	NR	ug/kg
79-01-6	Trichloroethene	50,000	U	NR	ug/kg
124-48-1	Dibromochloromethane	50,000	U	NR	ug/kg
79-00-5	1,1,2-Trichloroethane	50,000	U	NR	ug/kg
10061-02-6	trans-1,3-Dichloropropene	50,000	U	NR	ug/kg
75-25-2	Bromoform	50,000	U	NR	ug/kg
79-34-5	1,1,2,2-Tetrachloroethane	50,000	U	NR	ug/kg
127-18-4	Tetrachloroethene	50,000	U	NR	ug/kg
108-90-7	Chlorobenzene	50,000	U	NR	ug/kg
541-73-1	1,3-Dichlorobenzene	50,000	U	NR	ug/kg
95-50-1	1,2-Dichlorobenzene	50,000	U	NR	ug/kg
106-46-7	1,4-Dichlorobenzene	50,000	U	NR	ug/kg
D4,168-6	1,2-Dibromethane	50,000	U	NR	ug/kg
1634-04-4	tert-Butyl methyl ether	50,000	U	NR	ug/kg
71-43-2	Benzene	50,000	140,000	NR	ug/kg
108-88-3	Toluene	50,000	220,000	NR	ug/kg
100-41-4	Ethylbenzene	50,000	100,000	NR	ug/kg
1330-20-7	Total xylenes	50,000	420,000	NR	ug/kg
110-56-5	1,4-Dichlorobutane-SS		105		% rec
1423-10-5	Fluorobenzene		114		% rec

U = Compound analyzed for but not detected.
SS = Surrogate Standard reported as percent recovery.
NR = Not Required. This sample was analyzed by a modified EPA 8010/8020 Method.

Comments:

Reviewed by: WK

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client:	NA	Laboratory:	CH2M Hill/LRD	Date Sampled:	NA
Project:	NA	Lab Sample ID:	Method Blank	Date Received:	NA
Proj No:	NA	% Moisture:	100.0	Date Extracted:	NA
Method:	EPA 8010/8020	Dilution Factor:	1	Date Analyzed:	03/26/91
Matrix:	Water	Instrument ID:	3600	Analyst:	C.D.
Sampler:	NA			Date Reported:	04/01/91

Client Sample ID/Description: NA

CAS Number	Compound	Reporting Limit	Sample Result	Confirmation Result	Reporting Units
74-87-3	Chloromethane	1.0	U	NR	ug/L
74-83-9	Bromomethane	1.0	U	NR	ug/L
75-01-4	Vinyl chloride	1.0	U	NR	ug/L
75-00-3	Chloroethane	1.0	U	NR	ug/L
75-09-2	Dichloromethane	1.0	U	NR	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	NR	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	NR	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	NR	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	NR	ug/L
67-66-3	Chloroform	1.0	U	NR	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	NR	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	NR	ug/L
56-23-5	Carbon tetrachloride	1.0	U	NR	ug/L
75-27-4	Bromodichloromethane	1.0	U	NR	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	NR	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	NR	ug/L
79-01-6	Trichloroethene	1.0	U	NR	ug/L
124-48-1	Dibromochloromethane	1.0	U	NR	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	NR	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	NR	ug/L
75-25-2	Bromoform	1.0	U	NR	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	NR	ug/L
127-18-4	Tetrachloroethene	1.0	U	NR	ug/L
108-90-7	Chlorobenzene	1.0	U	NR	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	NR	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	NR	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	NR	ug/L
D4,168-6	1,2-Dibromethane	1.0	U	NR	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	NR	ug/L
71-43-2	Benzene	1.0	U	NR	ug/L
108-88-3	Toluene	1.0	U	NR	ug/L
100-41-4	Ethylbenzene	1.0	U	NR	ug/L
1330-20-7	Total xylenes	1.0	U	NR	ug/L
110-56-5	1,4-Dichlorobutane-SS		112		% rec
1423-10-5	Fluorobenzene		122		% rec

U = Compound analyzed for but not detected.
SS = Surrogate Standard reported as percent recovery.
NR = Not Required. This sample was analyzed by a modified EPA 8010/8020 Method.

Comments:

Reviewed by: WLL

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client:	NA	Laboratory:	CH2M Hill/LRD	Date Sampled:	NA
Project:	NA	Lab Sample ID:	Methanol Blank	Date Received:	NA
Proj No:	NA	% Moisture:	100.0	Date Extracted:	03/18/91
Method:	EPA 8010/8020	Dilution Factor:	1	Date Analyzed:	03/26/91
Matrix:	Solvent	Instrument ID:	3600	Analyst:	C.D.
Sampler:	NA			Date Reported:	04/01/91

Client Sample ID/Description: NA

CAS Number	Compound	Reporting Limit	Sample Result	Confirmation Result	Reporting Units
74-87-3	Chloromethane	50	U	NR	ug/kg
74-83-9	Bromomethane	50	U	NR	ug/kg
75-01-4	Vinyl chloride	50	U	NR	ug/kg
75-00-3	Chloroethane	50	U	NR	ug/kg
75-09-2	Dichloromethane	50	U	NR	ug/kg
75-69-4	Trichlorofluoromethane	50	600	NR	ug/kg
75-35-4	1,1-Dichloroethene	50	U	NR	ug/kg
75-34-3	1,1-Dichloroethane	50	U	NR	ug/kg
156-60-5	trans-1,2-Dichloroethene	50	U	NR	ug/kg
67-66-3	Chloroform	50	U	NR	ug/kg
107-06-2	1,2-Dichloroethane	50	U	NR	ug/kg
71-55-6	1,1,1-Trichloroethane	50	U	NR	ug/kg
56-23-5	Carbon tetrachloride	50	U	NR	ug/kg
75-27-4	Bromodichloromethane	50	U	NR	ug/kg
78-87-5	1,2-Dichloropropane	50	U	NR	ug/kg
10061-01-5	cis-1,3-Dichloropropene	50	U	NR	ug/kg
79-01-6	Trichloroethene	50	U	NR	ug/kg
124-48-1	Dibromochloromethane	50	U	NR	ug/kg
79-00-5	1,1,2-Trichloroethane	50	U	NR	ug/kg
10061-02-6	trans-1,3-Dichloropropene	50	U	NR	ug/kg
75-25-2	Bromoform	50	U	NR	ug/kg
79-34-5	1,1,2,2-Tetrachloroethane	50	U	NR	ug/kg
127-18-4	Tetrachloroethene	50	U	NR	ug/kg
108-90-7	Chlorobenzene	50	U	NR	ug/kg
541-73-1	1,3-Dichlorobenzene	50	U	NR	ug/kg
95-50-1	1,2-Dichlorobenzene	50	U	NR	ug/kg
106-46-7	1,4-Dichlorobenzene	50	U	NR	ug/kg
04,168-6	1,2-Dibromethane	50	U	NR	ug/kg
1634-04-4	tert-Butyl methyl ether	50	U	NR	ug/kg
71-43-2	Benzene	50	U	NR	ug/kg
108-88-3	Toluene	50	U	NR	ug/kg
100-41-4	Ethylbenzene	50	U	NR	ug/kg
1330-20-7	Total xylenes	50	U	NR	ug/kg
110-56-5	1,4-Dichlorobutane-SS		108		% rec
1423-10-5	Fluorobenzene		119		% rec

U = Compound analyzed for but not detected.
SS = Surrogate Standard reported as percent recovery.
NR = Not Required. This sample was analyzed by a modified EPA 8010/8020 Method.

Comments:

Reviewed by: WLK

BARR ENGINEERING CO.
7803 GLENROY ROAD
MINNEAPOLIS, MN 55439

PNA, 8100 per Herb Kelly

PROJECT NUMBER № 02738
13/491-004JSL011
NO:

PROJECT MANAGER: LDD
PROJECT CONTACT: Mary Mackey
LABORATORY:
REMARKS/ANALYSIS REQUIRED: Call Mary Mackey

CONTAINER TYPE AND NUMBER

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMP.	BLANK	VOLATILE ORGANIC	SEMIVOLATILE ORGANIC	FILTERED METALS	UNFILTERED METALS	GENERAL	CYANIDE	NUTRIENTS	OIL AND GREASE	TOC	SULFIDE	DIOXIN		TOTAL NO. OF CONTAINERS	REMARKS
	2/27/91	11:00am		X													001 ZS1	1	RE: Waukegan Tar Samples

per Herb Kelly/LMG:
8010/8020, semivol PP List w/TIC
PAH 8100 –
client is aware some analyses will be performed out of H.T.
Semivol - target of interest: o-dichlorobenzene, nitrobenzene, cyclohexane HK to AS 3/12 (sly)
3/13/91 - Add flashpoint analysis, per Herb Kelly + Kevin Sanders. NAS

FOR LAB USE ONLY
LAB # 18024
PROJ # LMG2731LXV
ACK EK 3/15/91 ... 3/14/91 (?) 3/14
HAZ/WBE/... (1) 3/14
QC LEVEL (1) 2 3
COC Yes — ICE No
ANA REQ No — TEMP 19°C
CUST SEAL No — PH NA
SAMPLE COND tar

ANALYSIS 8010/8020 (NAS per N. Kelly NAS 3/13)
QC LEVEL 1 DATE DUE 4/1/91
REPORT TO E. RAMUCHAK/LMG
SHIP # Fed-X LAB LCO INIT KG
5033370136

SAMPLED BY: Ray Wuolo	RELINQUISHED BY: Ray Wuolo	DATE 3/11/91	TIME	RECEIVED BY LAB: A. Silen	DATE 3/12/91	TIME 0900
RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LAB:	DATE	TIME
RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LAB:	DATE	TIME

REMARKS:

SAMPLES SHIPPED VIA ☐ AIR FREIGHT ☐ FED. EXP. ☐ SAMPLER ☐ OTHER

AIR BILL NUMBER: 3/12

DISTRIBUTION: WHITE-ORIGINAL ACCOMPANIES SHIPMENT TO LAB, RETURNS TO BARR WITH RESULTS; YELLOW-LAB COPY; PINK-LAB COORDINATOR; GOLD-FIELD COPY

13X58265 - LIMS - NAS - 3/12/91

APPENDIX B-2
COMPOSITE SOIL SAMPLES AND TAR SAMPLE LABORATORY ANALYSES AND TCLP REPORT

Engineers
Planners
CH2M HILL Economists
Scientists

April 26, 1991

LMG27317.XY

Ms. Mary Mackey
Barr Engineering Company
Four Paramount Plaza
7803 Glenroy Road, Suite 100
Minneapolis, Minnesota 55439-3123

RE: Analytical Data for LMG Laboratory No. 18244

Dear Ms. Mackey:

On April 4, 1991, the CH2M HILL Montgomery Laboratory received three sample with a request for analysis of selected organic and inorganic parameters.

The analytical results and associated quality control data are enclosed. Any unusual difficulties encountered during the analyses of these samples are discussed in the case narratives.

If you should have any questions concerning the data, please inquire.

The CH2M HILL policy is to store samples for up to 30 days after reporting. If you desire, our laboratory will maintain your samples for a longer period at a cost of $5.00 per sample per month. Samples determined to be hazardous can either be returned to you or disposed of at a cost of $25.00 per sample.

Sincerely,

Wanda L. Hall

Wanda L. Hall
Data Package Supervisor

Enclosures

cc: Mr. Larry Dalen

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548 Montgomery, Alabama 36116 205 271 3444

CH2M HILL Engineers Planners Economists Scientists

TABLE OF CONTENTS

CH2M HILL/LMG Laboratory No. 18244

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548, Montgomery Alabama 36116 205 271 3444

Engineers
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CH2M HILL/LMG Laboratory No. 18244

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548 Montgomery, Alabama 36116 205 271 3433

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ANALYTICAL METHODOLOGY

Organic Analysis

Priority Pollutants: Water, soil and waste samples are analyzed in accordance with procedures described in Methods 608, 624, and 625, EPA-600/4-82-057 (1982); Methods 8080, 8240, and 8270, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition; and methods outlined in the USEPA Contract Laboratory Program Statement of Work for Organics Analysis, February, 1988.

Volatile Analysis (Safe Drinking Water Act): Water samples are analyzed in accordance with procedures described in Method 524.2, Federal Register (50 FR 46902), November 13, 1985.

Chlorinated Phenoxyacid Herbicides: Samples are analyzed with procedures described in Method 8150, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Organophosphate Pesticides: Samples are analyzed in accordance with procedures described in Methods 614 and 622, EPA-600/4-79-019 (1979) and in Method 8140, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Phenol Analysis by GC: Samples are analyzed in accordance with procedures outlined in Method 604, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8040, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Polynuclear Aromatic Hydrocarbons (GC analysis): Samples are analyzed with procedures described in Method 610, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8100, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Ethylene Dibromide : Water samples are analyzed in accordance with procedures outlined in Method 504, Federal Register (50 FR 46902), November 13, 1985.

Trihalomethanes: Water samples are analyzed with procedures described in Method 501.2, Federal Register, Vol. 44, No. 231, Part II, November 29, 1979.

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive P O Box 230548 Montgomery Alabama 36116 205 271 7444

EPA - DEFINED QUALIFIERS

ORGANICS

Definitions for the EPA-defined qualifiers:

U -- Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the quantitation limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.

J -- Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound below the stated quantitation limit. The "J" qualifier is not used with pesticide results.

C -- This flag applies to pesticide results only. The "C" flag indicates the presence of this compound has been confirmed by GC/MS analysis.

B -- This flag is used when the analyte is found in the associated blank as well as the sample. This notation indicates possible blank contamination and suggests the data user evaluate these compounds and their amounts carefully.

E -- This flag applies to GC/MS only. The "E" qualifier indicates a compound may be above or below the linear range of the instrument. If the particular compound level is deemed above the linear calibration range, then the sample should be reanalyzed at an appropriate dilution. Therefore, the "E" qualified amount is an estimated concentration. The results for the dilution will be reported on a separate Form I and will be flagged with a "D" if the dilution brings the concentration within proper calibration.

D -- This flag identifies compounds which have been run at a dilution to bring the concentration of that compound within the linear range of the instrument. "D" qualifiers are only used for samples that have been run initially with results above acceptable ranges. For secondary dilutions the "DL" suffix is appended to the sample number on the Form I.

A -- Indicates the Tentatively Identified Compound (TIC) is a suspected aldol-condensation product.

X -- Indicates the compound concentration has been manually modified or the EPA qualifier has been manually modified or added.

JX -- The compound was detected and quantitated below the Contract Required Quantitation Limit.

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive P.O. Box 230548 Montgomery, Alabama 36116 205 271 3433

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CLIENT SAMPLE ID QUALIFIERS

LEVEL 1

The qualifiers that GC/MS uses with the client sample ID are defined below:

DL -- Dilution Run

R -- Rerun (may be followed by a digit to indicate multiple reruns)

RD -- Diluted Rerun

RX -- Re-extraction Analysis

MS -- Matrix Spike (may be followed by a digit to indicate multiple matrix spikes within a sample set)

MSD -- Matrix Spike Duplicate (may be followed by a digit to indicate multiple matrix spike duplicates within a sample set)

QC_BLANK -- Method Blank (may be followed by an **S** for soils run at a low level, **W** for waters, or **SM** for soils run at a medium level) (letters may be followed by a digit to indicate multiple blanks of that type; if there are no letters the digit indicates multiple blanks).

These qualifiers allow GC/MS to have unique client sample ID's so that the client can get more accurate information from the data reported.

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TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 18244

CH2M HILL Sample No.	Sample Description				
18244001	TS-3	03/27/91	1200	13/49-004JSL01	PO#03255
18244002	COMP-1	03/29/91		13/49-004JSL01	PO#03255
18244003	COMP-2	03/29/91		13/49-004JSL01	PO#03255

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CASE NARRATIVE FOR VOLATILE MASS SPECTROMETRY SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: BARR

CASE NO. : N/A CONTRACT NO.: N/A

LAB NO. : 18244 SDG NO.: N/A

I. RECEIPT

A. DATE : April 4, 1991

B. SAMPLE INFORMATION

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
18244001	TS-3	TAR	03/27/91	04/15/91	04/16/91
18244002	COMP-1	SOIL	03/29/91	04/15/91	04/15/91
18244003	COMP-2	SOIL	03/29/91	04/15/91	04/15/91
18244M02	COMP-1MSD	SOIL	03/29/91	04/15/91	04/15/91
18244D02	COMP-2MS	SOIL	03/29/91	04/15/91	04/15/91
L04151B2	QC_BLANK_SM	SOIL	NA	04/15/91	04/15/91

C. Documentation
Exceptions : On April 4, 1991 these three samples were received for volatile and semivolatile analyses. Two of the samples were identified as "COMP-2". After discussing this problem with the client a decision was made to identify the higher percentage solid sample as "COMP-2" and the higher percentage liquid sample as "COMP-1". Due to the nature of the matrix in these samples, percent moisture was not determined. Therefore, all results have been reported on a wet weight basis.

II. EXTRACTION

A. Holding Times: Due to a miscommunication, these samples were all extracted outside of holding times. As you have requested, the laboratory proceeded with the analyses of the samples.

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II. EXTRACTION (cont.)

B. Extraction Exceptions : Sample 18244001 consisted of a tar like matrix. An aliquot of this sample was diluted in a methylene chloride and then surrogates were added. This dilution was then used as the sample extract for analysis. A method blank (T04221B1) was generated at the same time and is the blank referenced to this sample. No other exceptions were encountered.

III. ANALYSIS

A. Holding Times: All holding times were met.

B. Analytical Exceptions : Please see attached table for information concerning Methylene chloride and acetone.

IV. QUALITY CONTROL

A. Method Blank : All associated method blanks met acceptable QC criteria.

B. Surrogate Recoveries : Analysis of samples 18244002 and 18244003 showed two surrogates out above QC limits. Due to the dilution required for analysis, the laboratory took no further action. All other samples met acceptable QC limits.

C. Matrix Spike Results : Please note that the relative percent difference for Benzene and Tolulene in 18244M02 and 18244D02 were outside QC limits. Since the percent recovery for these compounds in both samples were within QC limits, the laboratory took no further action. All other spike recoveries were within advisory QC limits.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Herb Kelly — Date 4/26/91
Manager, Organic Division

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CH2M HILL Engineers Planners Economists Scientists

METHYLENE CHLORIDE/ACETONE SUMMARY

Due to the level of target compounds, the following samples required large dilutions for analysis. As required by the statement of work, these dilution factors have been applied, without background subtraction, to all detected compounds, particularly methylene chloride and acetone. As methylene chloride and acetone are common laboratory contaminants, the following table is being provided to present a more accurate perspective of these compounds. Included in the table is 1) the amount of methylene chloride and acetone, detected at the instrument, prior to multiplication by the dilution factor; and 2) the amount of methylene chloride and acetone for that particular sample's laboratory method blank.

SAMPLE	METHYLENE CHLORIDE	ACETONE	METHOD BLANK	METHYLENE CHLORIDE	ACETONE
18244001	7 ug/Kg	11 ug/Kg	L04151B2	7 ug/Kg	8 ug/kg
18244002	7 ug/Kg	37 ug/Kg	L04151B2	7 ug/Kg	8 ug/kg
18244003	7 ug/Kg	40 ug/Kg	L04151B2	7 ug/Kg	8 ug/kg

000003

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	MED	Date Extracted:	04/15/91
Lab Sample ID:	18244001	Sample Matrix:	TAR	Date Analyzed:	04/16/91
Client Sample ID:	TS-3	Percent Moisture:		Dilution Factor:	6.2

VOLATILE COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
74-87-3	Chloromethane	7800	U	71-43-2	Benzene	79000	
74-83-9	Bromomethane	7800	U	10061-02-6	trans-1,3-Dichloropropene	3900	U
75-01-4	Vinyl Chloride	7800	U	110-75-8	2-Chloroethylvinylether	7800	U
75-00-3	Chloroethane	7800	U	75-25-2	Bromoform	3900	U
75-09-2	Methylene Chloride	5700	BJ	591-78-6	2-Hexanone	7800	BU
67-64-1	Acetone	8900	B	108-10-1	4-Methyl-2-Pentanone	7800	BU
75-15-0	Carbon Disulfide	3900	U	127-18-4	Tetrachloroethene	3900	U
75-69-4	Trichlorofluoromethane	3900	U	79-34-5	1,1,2,2-Tetrachloroethane	3900	U
75-35-4	1,1-Dichloroethene	3900	U	108-88-3	Toluene	130000	
75-34-3	1,1-Dichloroethane	3900	U	108-90-7	Chlorobenzene	3900	U
540-59-0	1,2-Dichloroethene (total)	3900	U	100-41-4	Ethylbenzene	65000	
67-66-3	Chloroform	3900	U	100-42-5	Styrene	91000	
107-06-2	1,2-Dichloroethane	3900	U	1330-20-7	Xylenes (total)	130000	B
78-93-3	2-Butanone	6000	J	541-73-1	1,3-Dichlorobenzene	3900	U
71-55-6	1,1,1-Trichloroethane	3900	U	106-46-7	1,4-Dichlorobenzene	3900	U
56-23-5	Carbon Tetrachloride	3900	U	95-50-1	1,2-Dichlorobenzene	3900	U
108-05-4	Vinyl Acetate	7800	U	107-02-8	Acrolein	78000	U
75-27-4	Bromodichloromethane	3900	U	74-88-4	Iodomethane	3900	U
78-87-5	1,2-Dichloropropane	3900	U	107-13-1	Acrylonitrile	78000	U
10061-01-5	cis-1,3-Dichloropropene	3900	U	74-95-3	Dibromomethane	3900	U
79-01-6	Trichloroethene	3900	U	97-63-2	Ethyl Methacrylate	3900	U
124-48-1	Dibromochloromethane	3900	U	96-18-4	1,2,3-Trichloropropane	3900	U
79-00-5	1,1,2-Trichloroethane	3900	U	110-57-6	Trans-1,4-Dichloro-2-Butene	3900	U

Toluene-d8 - SS	106
1,4-Bromofluorobenzene - SS	111
1,2-Dichloroethane-d4 - SS	102

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	MED	Date Extracted:	04/15/91
Lab Sample ID:	18244002	Sample Matrix:	SOIL	Date Analyzed:	04/15/91
Client Sample ID:	COMP-1	Percent Moisture:		Dilution Factor:	3.0

VOLATILE COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
74-87-3	Chloromethane	3800	U	71-43-2	Benzene	5100	
74-83-9	Bromomethane	3800	U	10061-02-6	trans-1,3-Dichloropropene	1900	U
75-01-4	Vinyl Chloride	3800	U	110-75-8	2-Chloroethylvinylether	3800	U
75-00-3	Chloroethane	3800	U	75-25-2	Bromoform	1900	U
75-09-2	Methylene Chloride	2800	BJ	591-78-6	2-Hexanone	3800	BU
67-64-1	Acetone	14000	B	108-10-1	4-Methyl-2-Pentanone	3800	BU
75-15-0	Carbon Disulfide	1900	U	127-18-4	Tetrachloroethene	1900	U
75-69-4	Trichlorofluoromethane	1900	U	79-34-5	1,1,2,2-Tetrachloroethane	1900	U
75-35-4	1,1-Dichloroethene	1900	U	108-88-3	Toluene	12000	
75-34-3	1,1-Dichloroethane	1900	U	108-90-7	Chlorobenzene	1900	U
540-59-0	1,2-Dichloroethene (total)	1900	U	100-41-4	Ethylbenzene	39000	
67-66-3	Chloroform	1900	U	100-42-5	Styrene	3100	
107-06-2	1,2-Dichloroethane	1900	U	1330-20-7	Xylenes (total)	40000	B
78-93-3	2-Butanone	3800	U	541-73-1	1,3-Dichlorobenzene	1900	U
71-55-6	1,1,1-Trichloroethane	1900	U	106-46-7	1,4-Dichlorobenzene	1900	U
56-23-5	Carbon Tetrachloride	1900	U	95-50-1	1,2-Dichlorobenzene	1900	U
108-05-4	Vinyl Acetate	3800	U	107-02-8	Acrolein	38000	U
75-27-4	Bromodichloromethane	1900	U	74-88-4	Iodomethane	1900	U
78-87-5	1,2-Dichloropropane	1900	U	107-13-1	Acrylonitrile	38000	U
10061-01-5	cis-1,3-Dichloropropene	1900	U	74-95-3	Dibromomethane	1900	U
79-01-6	Trichloroethene	1900	U	97-63-2	Ethyl Methacrylate	1900	U
124-48-1	Dibromochloromethane	1900	U	96-18-4	1,2,3-Trichloropropane	1900	U
79-00-5	1,1,2-Trichloroethane	1900	U	110-57-6	Trans-1,4-Dichloro-2-Butene	1900	U

Toluene-d8 - SS	131
1,4-Bromofluorobenzene - SS	134
1,2-Dichloroethane-d4 - SS	87

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	MED	Date Extracted:	04/15/91
Lab Sample ID:	18244003	Sample Matrix:	SOIL	Date Analyzed:	04/15/91
Client Sample ID:	COMP-2	Percent Moisture:		Dilution Factor:	10

VOLATILE COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
74-87-3	Chloromethane	12000	U	71-43-2	Benzene	21000	
74-83-9	Bromomethane	12000	U	10061-02-6	trans-1,3-Dichloropropene	6200	U
75-01-4	Vinyl Chloride	12000	U	110-75-8	2-Chloroethylvinylether	12000	U
75-00-3	Chloroethane	12000	U	75-25-2	Bromoform	6200	U
75-09-2	Methylene Chloride	9300	BJ	591-78-6	2-Hexanone	12000	BU
67-64-1	Acetone	51000	B	108-10-1	4-Methyl-2-Pentanone	12000	BU
75-15-0	Carbon Disulfide	6200	U	127-18-4	Tetrachloroethene	6200	U
75-69-4	Trichlorofluoromethane	6200	U	79-34-5	1,1,2,2-Tetrachloroethane	6200	U
75-35-4	1,1-Dichloroethene	6200	U	108-88-3	Toluene	26000	
75-34-3	1,1-Dichloroethane	6200	U	108-90-7	Chlorobenzene	6200	U
540-59-0	1,2-Dichloroethene (total)	6200	U	100-41-4	Ethylbenzene	140000	
67-66-3	Chloroform	6200	U	100-42-5	Styrene	6200	U
107-06-2	1,2-Dichloroethane	6200	U	1330-20-7	Xylenes (total)	150000	B
78-93-3	2-Butanone	12000	U	541-73-1	1,3-Dichlorobenzene	6200	U
71-55-6	1,1,1-Trichloroethane	6200	U	106-46-7	1,4-Dichlorobenzene	6200	U
56-23-5	Carbon Tetrachloride	6200	U	95-50-1	1,2-Dichlorobenzene	6200	U
108-05-4	Vinyl Acetate	12000	U	107-02-8	Acrolein	120000	U
75-27-4	Bromodichloromethane	6200	U	74-88-4	Iodomethane	6200	U
78-87-5	1,2-Dichloropropane	6200	U	107-13-1	Acrylonitrile	120000	U
10061-01-5	cis-1,3-Dichloropropene	6200	U	74-95-3	Dibromomethane	6200	U
79-01-6	Trichloroethene	6200	U	97-63-2	Ethyl Methacrylate	6200	U
124-48-1	Dibromochloromethane	6200	U	96-18-4	1,2,3-Trichloropropane	6200	U
79-00-5	1,1,2-Trichloroethane	6200	U	110-57-6	Trans-1,4-Dichloro-2-Butene	6200	U

Toluene-d8 - SS	120
1,4-Bromofluorobenzene - SS	134
1,2-Dichloroethane-d4 - SS	115

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	MED	Date Extracted:	04/15/91
Lab Sample ID:	L04151B2	Sample Matrix:	SOIL	Date Analyzed:	04/15/91
Client Sample ID:	QC BLANK SM	Percent Moisture:		Dilution Factor:	1.0

VOLATILE COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
74-87-3	Chloromethane	1200	U	71-43-2	Benzene	620	U
74-83-9	Bromomethane	1200	U	10061-02-6	trans-1,3-Dichloropropene	620	U
75-01-4	Vinyl Chloride	1200	U	110-75-8	2-Chloroethylvinylether	1200	U
75-00-3	Chloroethane	1200	U	75-25-2	Bromoform	620	U
75-09-2	Methylene Chloride	920	BJ	591-78-6	2-Hexanone	270	BJ
67-64-1	Acetone	970	BJ	108-10-1	4-Methyl-2-Pentanone	160	BJ
75-15-0	Carbon Disulfide	620	U	127-18-4	Tetrachloroethene	620	U
75-69-4	Trichlorofluoromethane	620	U	79-34-5	1,1,2,2-Tetrachloroethane	620	U
75-35-4	1,1-Dichloroethene	620	U	108-88-3	Toluene	620	U
75-34-3	1,1-Dichloroethane	620	U	108-90-7	Chlorobenzene	620	U
540-59-0	1,2-Dichloroethene (total)	620	U	100-41-4	Ethylbenzene	620	U
67-66-3	Chloroform	620	U	100-42-5	Styrene	620	U
107-06-2	1,2-Dichloroethane	620	U	1330-20-7	Xylenes (total)	290	BJ
78-93-3	2-Butanone	1200	U	541-73-1	1,3-Dichlorobenzene	620	U
71-55-6	1,1,1-Trichloroethane	620	U	106-46-7	1,4-Dichlorobenzene	620	U
56-23-5	Carbon Tetrachloride	620	U	95-50-1	1,2-Dichlorobenzene	620	U
108-05-4	Vinyl Acetate	1200	U	107-02-8	Acrolein	12000	U
75-27-4	Bromodichloromethane	620	U	74-88-4	Iodomethane	620	U
78-87-5	1,2-Dichloropropane	620	U	107-13-1	Acrylonitrile	12000	U
10061-01-5	cis-1,3-Dichloropropene	620	U	74-95-3	Dibromomethane	620	U
79-01-6	Trichloroethene	620	U	97-63-2	Ethyl Methacrylate	620	U
124-48-1	Dibromochloromethane	620	U	96-18-4	1,2,3-Trichloropropane	620	U
79-00-5	1,1,2-Trichloroethane	620	U	110-57-6	Trans-1,4-Dichloro-2-Butene	620	U

Toluene-d8 - SS	103
1,4-Bromofluorobenzene - SS	93
1,2-Dichloroethane-d4 - SS	91

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

000007

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: CH2M HILL/MGM Contract: _____

Lab Code: CH2M Case No.: V18244 SAS No.: _____ SDG No.: GC-MS

Matrix Spike - EPA Sample No.: COMP-1 Level:(low/med) MED

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene	6250	0	5650	90	59-172
Trichloroethene	6250	0	5650	90	62-137
Benzene	6250	5120	11100	96	66-142
Toluene	6250	12400	18200	93	59-139
Chlorobenzene	6250	0	5570	89	60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	6250	5720	92	-2	22	59-172
Trichloroethene	6250	5570	89	1	24	62-137
Benzene	6250	13100	128	-29 *	21	66-142
Toluene	6250	20900	136	-38 *	21	59-139
Chlorobenzene	6250	5610	90	-1	21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 2 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: CLP,V18244,,COMP-1,M,S,18244002,V,E,
10DG TO 200DG @6DG/MIN IH=4MIN

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CASE NARRATIVE FOR TCLP VOLATILES MASS SPECTROMETRY SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: BARR

CASE NO. : N/A CONTRACT NO.: N/A

LAB NO. : 18244 SDG NO.: N/A

I. RECEIPT

A. DATE : April 4, 1991

B. SAMPLE INFORMATION

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
18244001	TS-3	WATER	03/27/91	04/08/91	04/17/91
18244002	COMP-1	WATER	03/29/91	04/08/91	04/18/91
18244003	COMP-2	WATER	03/29/91	04/08/91	04/17/91
X04171B1	QC_BLANK_W	WATER	NA	NA	04/17/91
X04181B1	QC_BLANK_W_2	WATER	NA	NA	04/18/91
ZH040811	TCLP_BLANK	WATER	NA	04/08/91	04/17/91

C. Documentation

Exceptions : On April 4, 1991 these three samples were received for volatile and semivolatile analyses. Two of the samples were identified as "COMP-2". After discussing this problem with the client a decision was made to identify the higher percentage solid sample as "COMP-2" and the higher percentage liquid sample as "COMP-1". Due to the nature of the matrix in these samples, percent moisture was not determined. Therefore, all results have been reported on a wet weight basis. See attached TCLP summary.

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II. EXTRACTION

A. Holding Times: All holding times were met.

B. Extraction Exceptions : No exceptions were encountered.

III. ANALYSIS

A. Holding Times: All holding times were met.

B. Analytical Exceptions : No exceptions were encountered.

IV. QUALITY CONTROL

A. Method Blank : All associated method blanks met acceptable QC criteria.

B. Surrogate Recoveries : All samples met acceptable QC limits.

C. Matrix Spike Results : Matrix spike results have not been reported with this contract.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Herb Kelly — Date 4/26/91
Manager, Organic Division

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TCLP CASE NARRATIVE

The June 29, 1990, Federal Register (TCLP final rule) directs TCLP analytical results to be "bias corrected" according to the corresponding matrix spike recoveries for that analytical batch. The formula as published is:

$$X_c = 100\ (X_u / \%R)$$

where: X_c = corrected value;
X_u = measured value of the unspiked sample;
%R = % recovery of the batch-specific matrix spike.

All detected analyte concentrations and corresponding reporting limits, for the regulated compounds only, were "bias corrected" according to the formula.

Should you have any questions, please do not hesitate to call (205) 271-1444.

000011

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM
Lab Sample ID: 18244001
Client Sample ID: TS-3

Concentration: LOW
Sample Matrix: TAR
Percent Moisture: _____

Date Extracted: 04/08/91
Date Analyzed: 04/17/91
Dilution Factor: 50

VOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
75-01-4	Vinyl Chloride	500	U		
75-35-4	1,1-Dichloroethene	250	U		
67-66-3	Chloroform	250	U		
107-06-2	1,2-Dichloroethane	250	U		
78-93-3	2-Butanone	500	U		
56-23-5	Carbon Tetrachloride	250	U		
79-01-6	Trichloroethene	250	U		
71-43-2	Benzene	14000			
127-18-4	Tetrachloroethene	250	U		
108-90-7	Chlorobenzene	250	U		

	Toluene-d8 - SS	98			
	1,4-Bromofluorobenzene - SS	101			
	1,2-Dichloroethane-d4 - SS	101			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

000012

USC

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM
Lab Sample ID: 18244002
Client Sample ID: COMP-1

Concentration: LOW
Sample Matrix: SOIL
Percent Moisture: _____

Date Extracted: 04/08/91
Date Analyzed: 04/18/91
Dilution Factor: 10

VOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
75-01-4	Vinyl Chloride	100	U		
75-35-4	1,1-Dichloroethene	50	U		
67-66-3	Chloroform	50	U		
107-06-2	1,2-Dichloroethane	50	U		
78-93-3	2-Butanone	210			
56-23-5	Carbon Tetrachloride . . .	50	U		
79-01-6	Trichloroethene	50	U		
71-43-2	Benzene	3500			
127-18-4	Tetrachloroethene	50	U		
108-90-7	Chlorobenzene	50	U		

	Toluene-d8 - SS	104			
	1,4-Bromofluorobenzene - SS	102			
	1,2-Dichloroethane-d4 - SS	102			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

000013

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM
Lab Sample ID: 18244003
Client Sample ID: COMP-2

Concentration: LOW
Sample Matrix: SOIL
Percent Moisture: _____

Date Extracted: 04/08/91
Date Analyzed: 04/17/91
Dilution Factor: 10

VOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
75-01-4	Vinyl Chloride	100	U		
75-35-4	1,1-Dichloroethene	50	U		
67-66-3	Chloroform	50	U		
107-06-2	1,2-Dichloroethane	50	U		
78-93-3	2-Butanone	100	U		
56-23-5	Carbon Tetrachloride	50	U		
79-01-6	Trichloroethene	50	U		
71-43-2	Benzene	2400			
127-18-4	Tetrachloroethene	50	U		
108-90-7	Chlorobenzene	50	U		

	Toluene-d8 - SS	99			
	1,4-Bromofluorobenzene - SS	102			
	1,2-Dichloroethane-d4 - SS	99			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	
Lab Sample ID:	X04171B1	Sample Matrix:	WATER	Date Analyzed:	04/17/91
Client Sample ID:	QC BLANK W	Percent Moisture:		Dilution Factor:	1.0

VOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
75-01-4	Vinyl Chloride	10	U		
75-35-4	1,1-Dichloroethene	5	U		
67-66-3	Chloroform	5	U		
107-06-2	1,2-Dichloroethane	5	U		
78-93-3	2-Butanone	10	U		
56-23-5	Carbon Tetrachloride . . .	5	U		
79-01-6	Trichloroethene	5	U		
71-43-2	Benzene	5	U		
127-18-4	Tetrachloroethene	5	U		
108-90-7	Chlorobenzene	5	U		

	Toluene-d8 - SS	97			
	1,4-Bromofluorobenzene - SS	98			
	1,2-Dichloroethane-d4 - SS	100			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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Laboratory Name: CH2M HILL/MGM
Lab Sample ID: X04181B1
Client Sample ID: QC BLANK W 2

Concentration: LOW
Sample Matrix: WATER
Percent Moisture:

Date Extracted:
Date Analyzed: 04/18/91
Dilution Factor: 1.0

VOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
75-01-4	Vinyl Chloride	10	U		
75-35-4	1,1-Dichloroethene	5	U		
67-66-3	Chloroform	5	U		
107-06-2	1,2-Dichloroethane	5	U		
78-93-3	2-Butanone	10	U		
56-23-5	Carbon Tetrachloride . . .	5	U		
79-01-6	Trichloroethene	5	U		
71-43-2	Benzene	5	U		
127-18-4	Tetrachloroethene	5	U		
108-90-7	Chlorobenzene	5	U		

	Toluene-d8 - SS	98			
	1,4-Bromofluorobenzene - SS	103			
	1,2-Dichloroethane-d4 - SS	102			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

000016

LSC

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/08/91
Lab Sample ID:	ZH040811	Sample Matrix:	SOIL	Date Analyzed:	04/17/91
Client Sample ID:	TCLP BLANK	Percent Moisture:		Dilution Factor:	1.0

VOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
75-01-4	Vinyl Chloride	10	U		
75-35-4	1,1-Dichloroethene	5	U		
67-66-3	Chloroform	5	U		
107-06-2	1,2-Dichloroethane	5	U		
78-93-3	2-Butanone	10	U		
56-23-5	Carbon Tetrachloride . . .	5	U		
79-01-6	Trichloroethene	5	U		
71-43-2	Benzene	4	J		
127-18-4	Tetrachloroethene	5	U		
108-90-7	Chlorobenzene	5	U		

	Toluene-d8 - SS	104			
	1,4-Bromofluorobenzene - SS	101			
	1,2-Dichloroethane-d4 - SS	103			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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CASE NARRATIVE FOR SEMIVOLATILE MASS SPECTROMETRY SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: BARR

CASE NO. : N/A CONTRACT NO.: N/A

LAB NO. : 18244 SDG NO.: N/A

I. RECEIPT

A. DATE : April 4, 1991

B. SAMPLE INFORMATION

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
18244001	TS-3	TAR	03/27/91	04/22/91	04/24/91
18244002	COMP-1	SOIL	03/29/91	04/22/91	04/24/91
18244003	COMP-2	SOIL	03/29/91	04/22/91	04/24/91
S04221B1	QC_BLANK_S	SOIL	NA	04/22/91	04/24/91
T04221B1	QC_BLANK_S_2	SOIL	NA	04/22/91	04/24/91

C. Documentation Exceptions : On April 4, 1991 these three samples were received for volatile and semivolatile analyses. Two of the samples were identified as "COMP-2". After discussing this problem with the client a decision was made to identify the higher percentage solid sample as "COMP-2" and the higher percentage liquid sample as "COMP-1". Due to the nature of the matrix in these samples, percent moisture was not determined. Therefore, all results have been reported on a wet weight basis.

II. EXTRACTION

A. Holding Times: Due to a miscommunication, these samples were all extracted outside of holding times. As you have requested, the laboratory proceeded with the analyses of the samples.

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II. EXTRACTION (cont.)

B. Extraction Exceptions : Sample 18244001 consisted of a tar like matrix. An aliquot of this sample was diluted in a methylene chloride and then surrogates were added. This dilution was then used as the sample extract for analysis. A method blank (T04221B1) was generated at the same time and is the blank referenced to this sample. No other exceptions were encountered.

III. ANALYSIS

A. Holding Times: All holding times were met.

B. Analytical Exceptions : No exceptions were encountered.

IV. QUALITY CONTROL

A. Method Blank : All associated method blanks met acceptable QC criteria.

B. Surrogate Recoveries : Samples 18244001 and 18244002, and 18244003 all required dilutions for analysis. Therefore, surrogate recoveries have not been reported for these samples. All blank samples met acceptable QC limits.

C. Matrix Spike Results : Matrix spike results have not been reported with this contract.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Herb Kelly — Date
Manager, Organic Division

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/22/91
Lab Sample ID:	18244001	Sample Matrix:	TAR	Date Analyzed:	04/24/91
Client Sample ID:	TS-3	Percent Moisture:		Dilution Factor:	8000

POLYNUCLEAR AROMATIC COMPOUNDS

CAS Number		ug/Kg	CAS Number		ug/Kg
271-89-6	2,3-Benzofuran	80000 U	260-94-6	Acridine	80000 U
496-11-7	2,3-Dihydro-1h-Indene	80000 U	229-87-8	Phenanthridine	80000 U
95-13-6	1H-Indene	5.7E6	86-74-8	Carbazole	80000 U
91-20-3	Naphthalene	3.2E7	206-44-0	Fluoranthene	5.0E6
95-15-8	Benzo(b)thiophene	800000	129-00-0	Pyrene	7.6E6
91-22-5	Quinoline	80000 U	56-55-3	Benzo(a)anthracene	3.1E6
119-65-3	Isoquinoline	80000 U	218-01-9	Chrysene/Triphenylene	3.0E6
91-57-6	2-Methylnaphthalene	1.1E7		Benzo(b & k)fluoranthene	2.2E6
120-72-9	Indole	80000 U	57-97-6	7,12-Dimethylbenz(a)anthrac	80000 U
90-12-0	1-Methylnaphthalene	9.4E6	192-97-2	Benzo(e)pyrene	1.1E6
92-52-4	Biphenyl	2.0E6	50-32-8	Benzo(a)pyrene	2.3E6
208-96-8	Acenaphthylene	7.4E6	198-55-0	Perylene	360000
83-32-9	Acenaphthene	800000	56-49-5	3-Methylcholanthrene	80000 U
132-64-9	Dibenzofuran	580000	193-39-5	Indeno(1,2,3-cd)pyrene	680000
86-73-7	Fluorene	4.5E6	53-70-3	Dibenz(a,h)anthracene	80000 U
132-65-0	Dibenzothiophene	2.3E6	191-24-2	Benzo(g,h,i,)perylene	770000
85-01-8	Phenanthrene	1.4E7		----------	
120-12-7	Anthracene	4.4E6		1-Fluoronaphthalene - SS	**

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.
** - Surrogate Standard not determined due to required dilution.

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000020

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM
Lab Sample ID: 18244002
Client Sample ID: COMP-1

Concentration: LOW
Sample Matrix: SOIL
Percent Moisture:

Date Extracted: 04/22/91
Date Analyzed: 04/24/91
Dilution Factor: 90

POLYNUCLEAR AROMATIC COMPOUNDS

CAS Number		ug/Kg	CAS Number		ug/Kg
271-89-6	2,3-Benzofuran	30000 U	260-94-6	Acridine	30000 U
496-11-7	2,3-Dihydro-1h-Indene	20000 J	229-87-8	Phenanthridine	30000 U
95-13-6	1H-Indene	44000	86-74-8	Carbazole	3300 J
91-20-3	Naphthalene	360000	206-44-0	Fluoranthene	64000
95-15-8	Benzo(b)thiophene	11000 J	129-00-0	Pyrene	95000
91-22-5	Quinoline	30000 U	56-55-3	Benzo(a)anthracene	41000
119-65-3	Isoquinoline	30000 U	218-01-9	Chrysene/Triphenylene	40000
91-57-6	2-Methylnaphthalene	150000		Benzo(b & k)fluoranthene	28000 J
120-72-9	Indole	30000 U	57-97-6	7,12-Dimethylbenz(a)anthrac	30000 U
90-12-0	1-Methylnaphthalene	140000	192-97-2	Benzo(e)pyrene	15000 J
92-52-4	Biphenyl	26000 J	50-32-8	Benzo(a)pyrene	28000 J
208-96-8	Acenaphthylene	38000	198-55-0	Perylene	4900 J
83-32-9	Acenaphthene	84000	56-49-5	3-Methylcholanthrene	30000 U
132-64-9	Dibenzofuran	8600 J	193-39-5	Indeno(1,2,3-cd)pyrene	7800 J
86-73-7	Fluorene	58000	53-70-3	Dibenz(a,h)anthracene	3100 J
132-65-0	Dibenzothiophene	20000 J	191-24-2	Benzo(g,h,i,)perylene	9100 J
85-01-8	Phenanthrene	160000		---	
120-12-7	Anthracene	59000		1-Fluoronaphthalene - SS	**

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.
** - Surrogate Standard not determined due to required dilution.

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/22/91
Lab Sample ID:	18244003	Sample Matrix:	SOIL	Date Analyzed:	04/24/91
Client Sample ID:	COMP-2	Percent Moisture:		Dilution Factor:	450

POLYNUCLEAR AROMATIC COMPOUNDS

CAS Number		ug/Kg	CAS Number		ug/Kg
271-89-6	2,3-Benzofuran	150000U	260-94-6	Acridine	150000U
496-11-7	2,3-Dihydro-1h-Indene	240000	229-87-8	Phenanthridine	150000U
95-13-6	1H-Indene	180000	86-74-8	Carbazole	150000U
91-20-3	Naphthalene	2.0E6	206-44-0	Fluoranthene	240000
95-15-8	Benzo(b)thiophene	55000 J	129-00-0	Pyrene	400000
91-22-5	Quinoline	150000U	56-55-3	Benzo(a)anthracene	140000J
119-65-3	Isoquinoline	150000U	218-01-9	Chrysene/Triphenylene	150000
91-57-6	2-Methylnaphthalene	950000		Benzo(b & k)fluoranthene	88000 J
120-72-9	Indole	150000U	57-97-6	7,12-Dimethylbenz(a)anthrac	150000U
90-12-0	1-Methylnaphthalene	850000	192-97-2	Benzo(e)pyrene	46000 J
92-52-4	Biphenyl	130000J	50-32-8	Benzo(a)pyrene	89000 J
208-96-8	Acenaphthylene	78000 J	198-55-0	Perylene	15000 J
83-32-9	Acenaphthene	500000	56-49-5	3-Methylcholanthrene	150000U
132-64-9	Dibenzofuran	49000 J	193-39-5	Indeno(1,2,3-cd)pyrene	22000 J
86-73-7	Fluorene	280000	53-70-3	Dibenz(a,h)anthracene	150000U
132-65-0	Dibenzothiophene	140000J	191-24-2	Benzo(g,h,i,)perylene	26000 J
85-01-8	Phenanthrene	800000		----------	
120-12-7	Anthracene	270000		1-Fluoronaphthalene - SS	**

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.
** - Surrogate Standard not determined due to required dilution.

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000022

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM
Lab Sample ID: S04221B1
Client Sample ID: QC BLANK S

Concentration: LOW
Sample Matrix: SOIL
Percent Moisture:

Date Extracted: 04/22/91
Date Analyzed: 04/24/91
Dilution Factor: 1.0

POLYNUCLEAR AROMATIC COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
271-89-6	2,3-Benzofuran	330	U	260-94-6	Acridine	330	U
496-11-7	2,3-Dihydro-1h-Indene	330	U	229-87-8	Phenanthridine	330	U
95-13-6	1H-Indene	330	U	86-74-8	Carbazole	330	U
91-20-3	Naphthalene	330	U	206-44-0	Fluoranthene	330	U
95-15-8	Benzo(b)thiophene	330	U	129-00-0	Pyrene	330	U
91-22-5	Quinoline	330	U	56-55-3	Benzo(a)anthracene	330	U
119-65-3	Isoquinoline	330	U	218-01-9	Chrysene/Triphenylene	330	U
91-57-6	2-Methylnaphthalene	330	U		Benzo(b & k)fluoranthene	330	U
120-72-9	Indole	330	U	57-97-6	7,12-Dimethylbenz(a)anthrac	330	U
90-12-0	1-Methylnaphthalene	330	U	192-97-2	Benzo(e)pyrene	330	U
92-52-4	Biphenyl	330	U	50-32-8	Benzo(a)pyrene	330	U
208-96-8	Acenaphthylene	330	U	198-55-0	Perylene	330	U
83-32-9	Acenaphthene	330	U	56-49-5	3-Methylcholanthrene	330	U
132-64-9	Dibenzofuran	330	U	193-39-5	Indeno(1,2,3-cd)pyrene	330	U
86-73-7	Fluorene	330	U	53-70-3	Dibenz(a,h)anthracene	330	U
132-65-0	Dibenzothiophene	330	U	191-24-2	Benzo(g,h,i,)perylene	330	U
85-01-8	Phenanthrene	330	U		----------		
120-12-7	Anthracene	330	U		1-Fluoronaphthalene - SS	54	

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/22/91
Lab Sample ID:	T04221B1	Sample Matrix:	SOIL	Date Analyzed:	04/24/91
Client Sample ID:	QC BLANK S 2	Percent Moisture:		Dilution Factor:	1.0

POLYNUCLEAR AROMATIC COMPOUNDS

CAS Number		ug/Kg		CAS Number		ug/Kg	
271-89-6	2,3-Benzofuran	330	U	260-94-6	Acridine	330	U
496-11-7	2,3-Dihydro-1h-Indene	330	U	229-87-8	Phenanthridine	330	U
95-13-6	1H-Indene	330	U	86-74-8	Carbazole	330	U
91-20-3	Naphthalene	330	U	206-44-0	Fluoranthene	330	U
95-15-8	Benzo(b)thiophene	330	U	129-00-0	Pyrene	330	U
91-22-5	Quinoline	330	U	56-55-3	Benzo(a)anthracene	330	U
119-65-3	Isoquinoline	330	U	218-01-9	Chrysene/Triphenylene	330	U
91-57-6	2-Methylnaphthalene	330	U		Benzo(b & k)fluoranthene	330	U
120-72-9	Indole	330	U	57-97-6	7,12-Dimethylbenz(a)anthrac	330	U
90-12-0	1-Methylnaphthalene	330	U	192-97-2	Benzo(e)pyrene	330	U
92-52-4	Biphenyl	330	U	50-32-8	Benzo(a)pyrene	330	U
208-96-8	Acenaphthylene	330	U	198-55-0	Perylene	330	U
83-32-9	Acenaphthene	330	U	56-49-5	3-Methylcholanthrene	330	U
132-64-9	Dibenzofuran	330	U	193-39-5	Indeno(1,2,3-cd)pyrene	330	U
86-73-7	Fluorene	330	U	53-70-3	Dibenz(a,h)anthracene	330	U
132-65-0	Dibenzothiophene	330	U	191-24-2	Benzo(g,h,i,)perylene	330	U
85-01-8	Phenanthrene	330	U		----------		
120-12-7	Anthracene	330	U		1-Fluoronaphthalene - SS	68	

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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CASE NARRATIVE FOR TCLP SEMIVOLATILES MASS SPECTROMETRY SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: BARR

CASE NO. : N/A CONTRACT NO.: N/A

LAB NO. : 18244 SDG NO.: N/A

I. RECEIPT

A. DATE : April 4, 1991

B. SAMPLE INFORMATION

LAB ID	CLIENT ID	SAMPLE MATRIX	DATE SAMPLED	EXTRACTION DATE	ANALYSIS DATE
18244001	TS-3	TAR	03/27/91	04/11/91	04/23/91
18244002	COMP-1	SOIL	03/29/91	04/11/91	04/24/91
18244003	COMP-2	SOIL	03/29/91	04/11/91	04/24/91
W04111B1	QC_BLANK_W	WATER	NA	04/11/91	04/23/91
TC040901	TCLP_BLANK	SOIL	NA	04/11/91	04/23/91

C. Documentation Exceptions : On April 4, 1991 these three samples were received for volatile and semivolatile analyses. Two of the samples were identified as "COMP-2". After discussing this problem with the client a decision was made to identify the higher percentage solid sample as "COMP-2" and the higher percentage liquid sample as "COMP-1". Due to the nature of the matrix in these samples, percent moisture was not determined. Therefore, all results have been reported on a wet weight basis. See attached TCLP summary.

000025

II. EXTRACTION

A. Holding Times: All holding times were met. The semivolatile TCLP extraction was performed on April 9, 1991.

B. Extraction Exceptions : No exceptions were encountered.

III. ANALYSIS

A. Holding Times: All holding times were met.

B. Analytical Exceptions : No exceptions were encountered.

IV. QUALITY CONTROL

A. Method Blank : All associated method blanks met acceptable QC criteria.

B. Surrogate Recoveries : All samples met acceptable QC limits. According to CLP protocol, one surrogate per fraction may be outside of QC limits as long as the recovery is ten percent or greater.

C. Matrix Spike Results : Matrix spike results have not been reported with this contract.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Herb Kelly — Date 4/16/91
Manager, Organic Division

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TCLP CASE NARRATIVE

The June 29, 1990, Federal Register (TCLP final rule) directs TCLP analytical results to be "bias corrected" according to the corresponding matrix spike recoveries for that analytical batch. The formula as published is:

$$X_c = 100 \ (X_a / \%R)$$

where: X_c = corrected value;
X_a = measured value of the unspiked sample;
%R = % recovery of the batch-specific matrix spike.

All detected analyte concentrations and corresponding reporting limits, for the regulated compounds only, were "bias corrected" according to the formula.

Should you have any questions, please do not hesitate to call (205) 271-1444.

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/11/91
Lab Sample ID:	18244001	Sample Matrix:	TAR	Date Analyzed:	04/23/91
Client Sample ID:	TS-3	Percent Moisture:		Dilution Factor:	2.0

SEMIVOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
106-46-7	1,4-Dichlorobenzene . . .	20	U		
67-72-1	Hexachloroethane	20	U		
98-95-3	Nitrobenzene	20	U		
87-68-3	Hexachlorobutadiene . . .	20	U		
88-06-2	2,4,6-Trichlorophenol . .	20	U		
95-95-4	2,4,5-Trichlorophenol . .	20	U		
121-14-2	2,4-Dinitrotoluene	20	U		
118-74-1	Hexachlorobenzene	20	U		
87-86-5	Pentachlorophenol	20	U		
110-86-1	Pyridine	100	U		
95-48-7	Cresol (Total)	1800			

	Nitrobenzene-d5 - SS . . .	136			
	2-Fluorobiphenyl - SS . .	83			
	Terphenyl-d14 - SS	75			
	Phenol-d5 - SS	50			
	2-Fluorophenol - SS . . .	99			
	2,4,6-Tribromophenol - SS	92			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

CH2M HILL Quality Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116
205 271 1444

Engineers
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CH2M HILL Economists
Scientists

ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/11/91
Lab Sample ID:	18244002	Sample Matrix:	SOIL	Date Analyzed:	04/24/91
Client Sample ID:	COMP-1	Percent Moisture:		Dilution Factor:	2.0

SEMIVOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
106-46-7	1,4-Dichlorobenzene . . .	20	U		
67-72-1	Hexachloroethane	20	U		
98-95-3	Nitrobenzene	20	U		
87-68-3	Hexachlorobutadiene . . .	20	U		
88-06-2	2,4,6-Trichlorophenol . .	20	U		
95-95-4	2,4,5-Trichlorophenol . .	20	U		
121-14-2	2,4-Dinitrotoluene	20	U		
118-74-1	Hexachlorobenzene	20	U		
87-86-5	Pentachlorophenol	20	U		
110-86-1	Pyridine	100	U		
95-48-7	Cresol (Total)	150			

	Nitrobenzene-d5 - SS . . .	101			
	2-Fluorobiphenyl - SS . .	44			
	Terphenyl-d14 - SS	61			
	Phenol-d5 - SS	49			
	2-Fluorophenol - SS . . .	86			
	2,4,6-Tribromophenol - SS	82			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548, Montgomery, Alabama 36116 205 271 1444

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/11/91
Lab Sample ID:	18244003	Sample Matrix:	SOIL	Date Analyzed:	04/24/91
Client Sample ID:	COMP-2	Percent Moisture:		Dilution Factor:	2.0

SEMIVOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
106-46-7	1,4-Dichlorobenzene . . .	20	U		
67-72-1	Hexachloroethane	20	U		
98-95-3	Nitrobenzene	20	U		
87-68-3	Hexachlorobutadiene . . .	20	U		
88-06-2	2,4,6-Trichlorophenol . .	20	U		
95-95-4	2,4,5-Trichlorophenol . .	20	U		
121-14-2	2,4-Dinitrotoluene	20	U		
118-74-1	Hexachlorobenzene	20	U		
87-86-5	Pentachlorophenol	20	U		
110-86-1	Pyridine	100	U		
95-48-7	Cresol (Total)	26			

	Nitrobenzene-d5 - SS . . .	116			
	2-Fluorobiphenyl - SS . .	76			
	Terphenyl-d14 - SS	72			
	Phenol-d5 - SS	43			
	2-Fluorophenol - SS . . .	72			
	2,4,6-Tribromophenol - SS	62			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

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CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548, Montgomery, Alabama 36116 205 271 1444

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/11/91
Lab Sample ID:	W04111B1	Sample Matrix:	WATER	Date Analyzed:	04/23/91
Client Sample ID:	QC BLANK W	Percent Moisture:		Dilution Factor:	2.0

SEMIVOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
106-46-7	1,4-Dichlorobenzene . . .	20	U		
67-72-1	Hexachloroethane	20	U		
98-95-3	Nitrobenzene	20	U		
87-68-3	Hexachlorobutadiene . . .	20	U		
88-06-2	2,4,6-Trichlorophenol . .	20	U		
95-95-4	2,4,5-Trichlorophenol . .	20	U		
121-14-2	2,4-Dinitrotoluene	20	U		
118-74-1	Hexachlorobenzene	20	U		
87-86-5	Pentachlorophenol	20	U		
110-86-1	Pyridine	100	U		
95-48-7	Cresol (Total)	40	U		

	Nitrobenzene-d5 - SS . . .	83			
	2-Fluorobiphenyl - SS . .	76			
	Terphenyl-d14 - SS	83			
	Phenol-d5 - SS	48			
	2-Fluorophenol - SS . . .	86			
	2,4,6-Tribromophenol - SS	87			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

CH2M HILL
Quality Analytical Laboratories
2567 Fairlane Drive, P O Box 230548, Montgomery, Alabama 36116
205 271 1444

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ORGANICS ANALYSIS DATA SHEET

Laboratory Name:	CH2M HILL/MGM	Concentration:	LOW	Date Extracted:	04/11/91
Lab Sample ID:	TC040901	Sample Matrix:	SOIL	Date Analyzed:	04/23/91
Client Sample ID:	TCLP BLANK	Percent Moisture:		Dilution Factor:	2.0

SEMIVOLATILE TCLP COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
106-46-7	1,4-Dichlorobenzene . . .	20	U		
67-72-1	Hexachloroethane	20	U		
98-95-3	Nitrobenzene	20	U		
87-68-3	Hexachlorobutadiene . . .	20	U		
88-06-2	2,4,6-Trichlorophenol . .	20	U		
95-95-4	2,4,5-Trichlorophenol . .	20	U		
121-14-2	2,4-Dinitrotoluene	20	U		
118-74-1	Hexachlorobenzene	20	U		
87-86-5	Pentachlorophenol	20	U		
110-86-1	Pyridine	100	U		
95-48-7	Cresol (Total)	40	U		

	Nitrobenzene-d5 - SS . . .	84			
	2-Fluorobiphenyl - SS . .	84			
	Terphenyl-d14 - SS	78			
	Phenol-d5 - SS	54			
	2-Fluorophenol - SS . . .	97			
	2,4,6-Tribromophenol - SS	86			

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
SS - Surrogate Standard reported as percent recovery.

Form I

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P O Box 230548, Montgomery, Alabama 36116 205 271 1444

CH2M HILL Engineers Planners Economists Scientists

CASE NARRATIVE
Cations

Batch Number: 18244

Client/Project: BARR ENGINEERING CO.

I. Holding Time:
All holding times were met.

II. Analysis:

A. Blanks:
All acceptance criteria were met.

B. Calibration:
All acceptance criteria were met.

C. ICP Interference Check Sample:
All acceptance criteria were met.

D. Spike Sample Analysis:
All acceptance criteria were met.

E. Duplicate Sample Analysis:
All acceptance criteria were met.

F. Laboratory Control Sample Analysis:
All acceptance criteria were met.

G. ICP Serial Dilution:
All acceptance criteria were met.

H. Other:
None.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ DATE: 26APR91

Kevin A. Sanders
Inorganic Division Manager

000033

CH2M HILL Engineers Planners Economists Scientists

TCLP CASE NARRATIVE

The June 29, 1990, Federal Register (TCLP final rule) directs TCLP analytical results to be "bias corrected" according to the corresponding matrix spike recoveries for that analytical batch. The formula as published is:

$$X_c = 100\ (X_a / \%R)$$

where: X_c = corrected value;
X_a = measured value of the unspiked sample;
%R = % recovery of the batch-specific matrix spike.

All detectable concentrations were "bias corrected" according to this formula. The raw value, batch specific spike recovery, and adjusted value are listed below.

LMG SAMPLE NO.	ANALYTE	RAW CONC (ug/L)	PRE-SPIKE % REC	BIAS CORRECTED CONC (ug/L)
18244002	TCLP BARIUM	256	90	284
18244003	TCLP ARSENIC	12	75	16
18244003	TCLP BARIUM	238	90	264

Should you have any questions regarding this narrative, please do not hesitate to call me at (205) 271-1445, extension 430.

Kevin A. Sanders
Inorganic Division Manager

000034

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CASE NARRATIVE
General Chemistry

Batch Number: 18244

Client/Project: BARR ENGINEERING COMPANY

I. Holding Time: All criteria met.

II. Analysis:

A.	Calibration:	Acceptance criteria met.
B.	Blanks:	Acceptance criteria met.
C.	Matrix Spike:	Acceptance criteria met.
D.	Duplicate Analysis:	Acceptance criteria met.
E.	Lab Control Sample:	Acceptance criteria met.
F.	Other:	None.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ DATE: 26APR91

Kevin A. Sanders
Inorganic Division Manager

000035

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REPORT OF ANALYTICAL RESULTS

Date: 04/18/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO. 03255
Laboratory Number: 18244
Date Received: 04/04/91

Sample Description: TS-3 1200 GRAB
Laboratory Sample Number: 18244001 Date Collected: 03/27/91 Matrix: TAR

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Silver	EPA200.7/SW6010	2.5	<2.5	mg/kg	04/17/91
TCLP Silver	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Arsenic	EPA206.2/SW7060	2.5	<2.5	mg/kg	04/18/91
TCLP Arsenic	EPA206.2/SW7060	10	<10	ug/L	04/10/91
Ash	SM302H	0.1	31.4	%	04/08/91
Barium	EPA200.7/SW6010	51.0	<51.0	mg/kg	04/17/91
TCLP Barium	EPA200.7/SW6010	200	<200	ug/L	04/17/91
Cadmium	EPA200.7/SW6010	1.3	<1.3	mg/kg	04/17/91
TCLP Cadmium	EPA200.7/SW6010	5	<5	ug/L	04/17/91
Chromium	EPA200.7/SW6010	2.5	<2.5	mg/kg	04/17/91
TCLP Chromium	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Mercury	SW7471	0.12	<0.12	mg/kg	04/17/91
TCLP Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	04/12/91
Nickel	EPA200.7/SW6010	10.0	<10.0	mg/kg	04/17/91
Lead	EPA239.2/SW7421	0.8	10.3	mg/kg	04/17/91
TCLP Lead	EPA200.7/SW6010	100	<100	ug/L	04/17/91
Selenium	EPA270.2/SW7740	1.3	<1.3	mg/kg	04/17/91
TCLP Selenium	EPA270.2/SW7740	25	<25	ug/L	04/11/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

000036

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REPORT OF ANALYTICAL RESULTS

Date: 04/18/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO. 03255
Laboratory Number: 18244
Date Received: 04/04/91

Sample Description: COMP-1 COMP
Laboratory Sample Number: 18244002 Date Collected: 03/29/91 Matrix: TAR

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Silver	EPA200.7/SW6010	2.7	<2.7	mg/kg	04/17/91
TCLP Silver	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Arsenic	EPA206.2/SW7060	2.7	7.5	mg/kg	04/18/91
TCLP Arsenic	EPA206.2/SW7060	10	<10	ug/L	04/10/91
Ash	SM302H	0.1	70.4	%	04/08/91
Barium	EPA200.7/SW6010	54.0	<54.0	mg/kg	04/17/91
TCLP Barium	EPA200.7/SW6010	222	284	ug/L	04/17/91
Cadmium	EPA200.7/SW6010	1.3	<1.3	mg/kg	04/17/91
TCLP Cadmium	EPA200.7/SW6010	5	<5	ug/L	04/17/91
Chromium	EPA200.7/SW6010	2.7	8.2	mg/kg	04/17/91
TCLP Chromium	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Mercury	SW7471	0.10	<0.10	mg/kg	04/17/91
TCLP Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	04/12/91
Nickel	EPA249.2	11.0	<11.0	mg/kg	04/17/91
Lead	EPA239.2/SW7421	1.6	17.0	mg/kg	04/17/91
TCLP Lead	EPA200.7/SW6010	100	<100	ug/L	04/17/91
Selenium	EPA270.2/SW7740	1.3	<1.3	mg/kg	04/17/91
TCLP Selenium	EPA270.2/SW7740	25	<25	ug/L	04/11/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

000037

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REPORT OF ANALYTICAL RESULTS

Date: 04/18/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO. 03255
Laboratory Number: 18244
Date Received: 04/04/91

Sample Description: COMP-2 COMP
Laboratory Sample Number: 18244003 Date Collected: 03/29/91 Matrix: TAR

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Silver	EPA200.7/SW6010	2.6	<2.6	mg/kg	04/17/91
TCLP Silver	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Arsenic	EPA206.2/SW7060	2.6	8.5	mg/kg	04/18/91
TCLP Arsenic	EPA206.2/SW7060	13	16	ug/L	04/10/91
Ash	SM302H	0.1	64.5	%	04/08/91
Barium	EPA200.7/SW6010	51.0	<51.0	mg/kg	04/17/91
TCLP Barium	EPA200.7/SW6010	222	264	ug/L	04/17/91
Cadmium	EPA200.7/SW6010	1.3	<1.3	mg/kg	04/17/91
TCLP Cadmium	EPA200.7/SW6010	5	<5	ug/L	04/17/91
Chromium	EPA200.7/SW6010	2.6	16	mg/kg	04/17/91
TCLP Chromium	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Mercury	SW7471	0.09	<0.09	mg/kg	04/17/91
TCLP Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	04/12/91
Nickel	EPA200.7/SW6010	10.0	<10.0	mg/kg	04/17/91
Lead	EPA239.2/SW7421	2.3	15.3	mg/kg	04/17/91
TCLP Lead	EPA200.7/SW6010	100	<100	ug/L	04/17/91
Selenium	EPA270.2/SW7740	1.3	<1.3	mg/kg	04/17/91
TCLP Selenium	EPA270.2/SW7740	25	<25	ug/L	04/11/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

000038

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REPORT OF ANALYTICAL RESULTS

Date: 04/18/91

Client: BARR ENGINEERING COMPANY
FOUR PARAMOUNT PLAZA
7803 GLENROY ROAD, SUITE 100
MINNEAPOLIS, MN 55439-3123
Atten: MS. MARY MACKEY

Project Number: LMG27317.XY
13/49-004JSL01 NO. 03255
Laboratory Number: 18244
Date Received: 04/04/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 18244ZS1 Date Collected: 04/04/91 Matrix: TAR BLANK

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Silver	EPA200.7/SW6010	10	<10	ug/L	04/17/91
TCLP Silver	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Arsenic	EPA206.2/SW7060	10	<10	ug/L	04/18/91
TCLP Arsenic	EPA206.2/SW7060	10	<10	ug/L	04/10/91
Barium	EPA200.7/SW6010	200	<200	ug/L	04/17/91
TCLP Barium	EPA200.7/SW6010	200	<200	ug/L	04/17/91
Cadmium	EPA200.7/SW6010	5	<5	ug/L	04/17/91
TCLP Cadmium	EPA200.7/SW6010	5	<5	ug/L	04/17/91
Chromium	EPA200.7/SW6010	10	<10	ug/L	04/17/91
TCLP Chromium	EPA200.7/SW6010	10	<10	ug/L	04/17/91
Mercury	SW7471	0.2	<0.2	ug/L	04/17/91
TCLP Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	04/12/91
Nickel	EPA200.7/SW6010	40	<40	ug/L	04/17/91
Lead	EPA239.2/SW7421	3	<3	ug/L	04/17/91
TCLP Lead	EPA200.7/SW6010	100	<100	ug/L	04/17/91
Selenium	EPA270.2/SW7740	5	<5	ug/L	04/17/91
TCLP Selenium	EPA270.2/SW7740	3	<3	ug/L	04/11/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

000039

BARR ENGINEERING CO.
7803 GLENROY ROAD
MINNEAPOLIS, MN 55439

TCLP

PROJECT NUMBER № 03255
1 3 / 4 9 - 0 0 4 J S L 0 1

NO:

PROJECT MANAGER: Larry Dalen
PROJECT CONTACT: Mary Mackey
LABORATORY:

CONTAINER TYPE AND NUMBER: VOLATILE ORGANIC | SEMIVOLATILE ORGANIC | FILTERED METALS | UNFILTERED METALS | GENERAL | CYANIDE | NUTRIENTS | OIL AND GREASE | TOC | SULFIDE | DIOXIN

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMP.	BLANK	(lab no.)	SAMPLE #	TOTAL NO. OF CONTAINERS	REMARKS/ ANALYSIS REQUIRED
TS-3	3/27/91	12:00	X			001	1	1	Contact Mary
Comp-1	3/29/91	—		X		002	2	1	Mackey (612) 830-0555
Comp-2	3/29/91	—		X		003	3	1	for Requested Analysis
Method Blank						231			Full TCLP's 2WK TAT
									Due: 4-18-91

Received 2 bottles marked Comp-2
Talked to Mary Mackey – Decided to call
the sample that was in a clump → Comp-2
& the other which had more liquid → Comp-1.
M. Mackey requests this be noted on the report.
Based on M. Mackey's conversation w/ Sampler, PA 4-4-91

182 44
LM6 273178Y 4514102
yes yes yes 5°C N/A
Tar

SAMPLED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LAB:	DATE	TIME
Greg Weirlo	Greg Weirlo	4/1/91	17:00	Allen F. Smith	4/2/91	0930
RECEIVED BY:	RELINQUISHED BY: Mary Paschke	4/3/91	1415	RECEIVED BY LAB: Penelope E. Rutowski	4/4/91	0900
RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LAB:	DATE	TIME

REMARKS

SAMPLES SHIPPED VIA FEDX
☐ AIR FREIGHT ☐ FED. EXP. ☐ SAMPLER
☐ OTHER

A FEDERAL 802 5517 421
CUSTOMER PACKAGE TRACKING NUMBER — PULL UP PURPLE TAB

DISTRIBUTION: WHITE-ORIGINAL ACCOMPANIES SHIPMENT TO LAB, RETURNS TO BARR WITH RESULTS; YELLOW-LAB COPY; PINK-LAB COORDINATOR; GOLD-FIELD COPY

LIMS: B4460163

000040

APPENDIX C
QUALITY CONTROL EVALUATION

QUALITY CONTROL EVALUATION

1.0 INTRODUCTION

Quality control data from the tar pit monitoring at the Waukegan tar pit site were evaluated to determine the validity of the analytical results.

Quality control procedures conducted at the laboratory included the use of approved methodologies, independent verification of analytical standards, and analysis of method blanks, duplicate samples and spiked samples.

2.0 LABORATORY QUALITY CONTROL

All samples were analyzed at CH2M Hill Laboratory in Montgomery, Alabama. CH2M Hill conducted quality control procedures on a daily basis to determine the validity of the analytical data. Analytical results of the quality control samples were compared with established performance criteria to determine if the data were within accuracy and precision limits expected of the method.

Method blanks were analyzed for volatile organic and semi-volatile organic compounds. These results are shown in Tables 1 and 2, respectively. Trichlorofluoromethane was detected in one method blank, however the sample showed no detectable levels. No semi-volatile organic compounds were detected in the method blanks.

3.0 SUMMARY

No unusual difficulties were reported during this analysis. Quality control review by Barr Engineering did not show any problems with the data. Duplicate analysis was performed on the sample using different analytical procedures for semi-volatile organic compounds.

Semi-volatile organic analysis was performed following procedures of EPA SW846 method 8270. This is a gas chromatography/mass spectrometry (GC/MS) method. A solvent extraction was performed using 1/10 of a gram of sample. No clean-up procedures were performed on the sample extract. The sample required dilution to keep results within the linear calibration range. The dilution factor was 8700.

Polynuclear aromatic hydrocarbon (semi-volatile compounds) analysis was performed following procedures of EPA SW846 method 8100. This

is a gas chromatography method with a flame ionization detector (FID). This method also requires a solvent extraction, 1/10 of a gram of sample was used. Gel-permeation clean-up was performed on the sample extract to further purify the extract. This sample also required dilution. The dilution factor was 50.

The values reported from both methods showed good accuracy (the same compounds were identified using both procedures) and the precision (variability in the value reported) are attributed to the differences in methodologies mentioned above and the matrix of the sample.